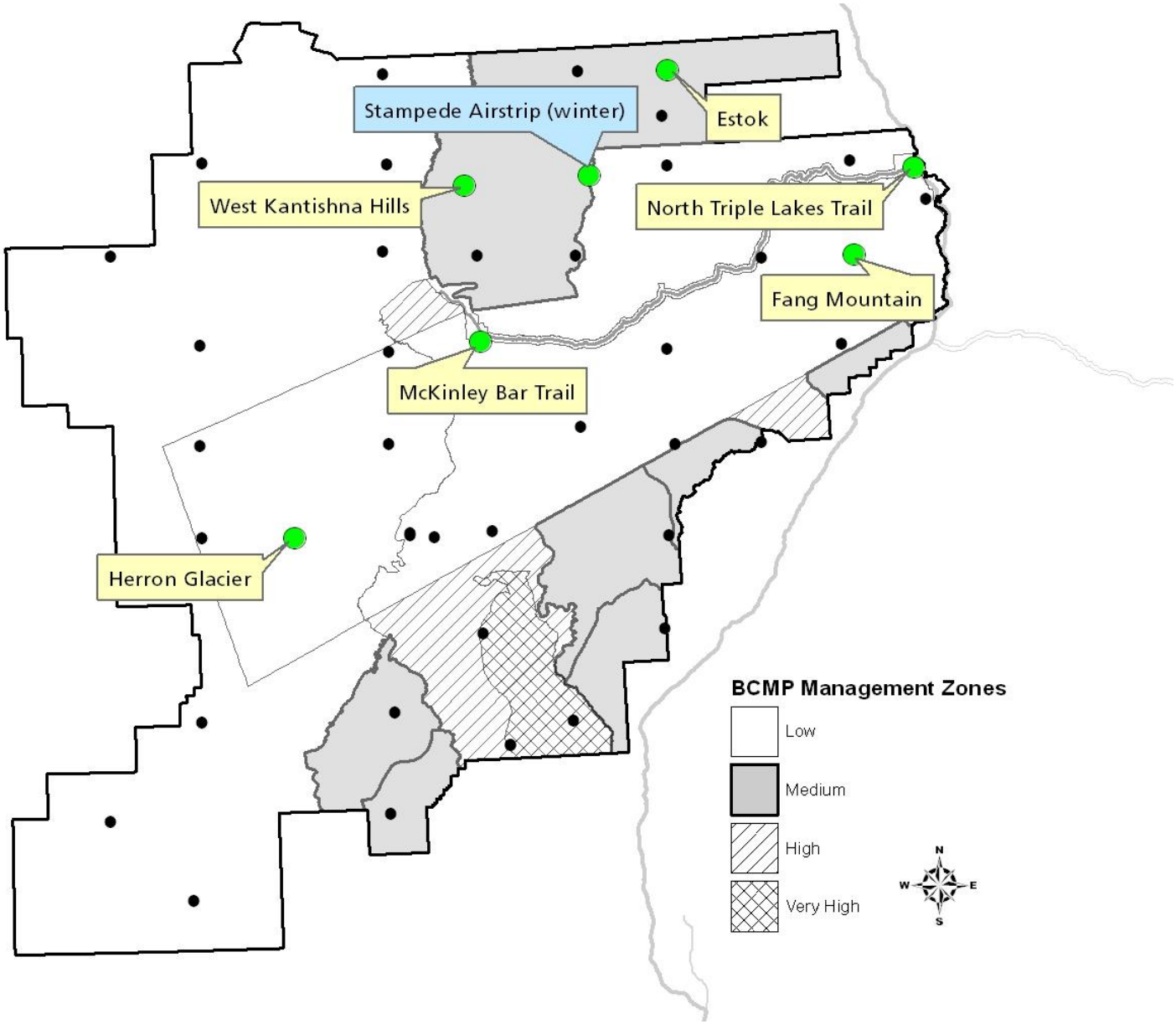
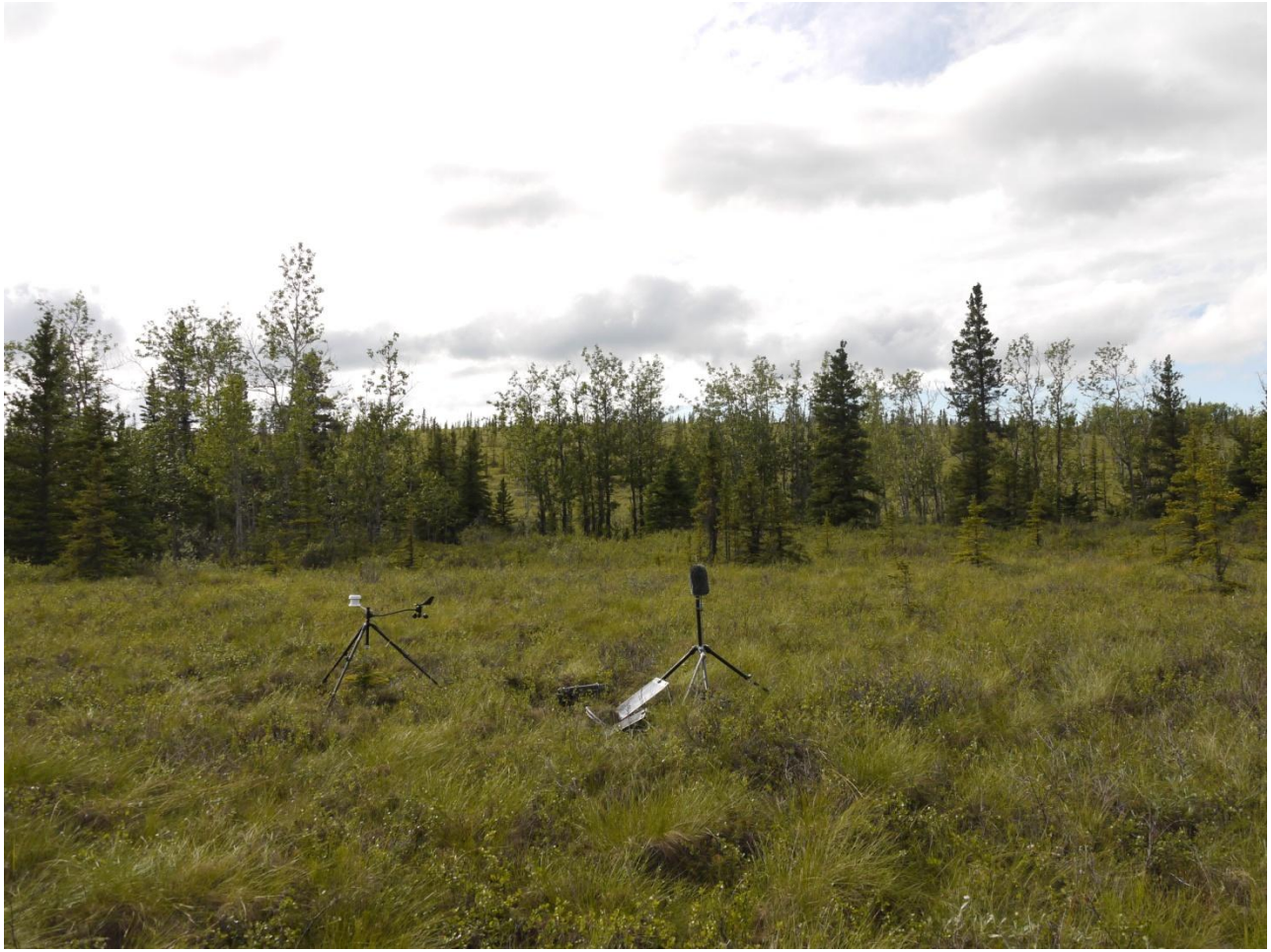
Denali Soundscapes: Data Summary, 2011

Davyd Betchkal
Physical Science Technician

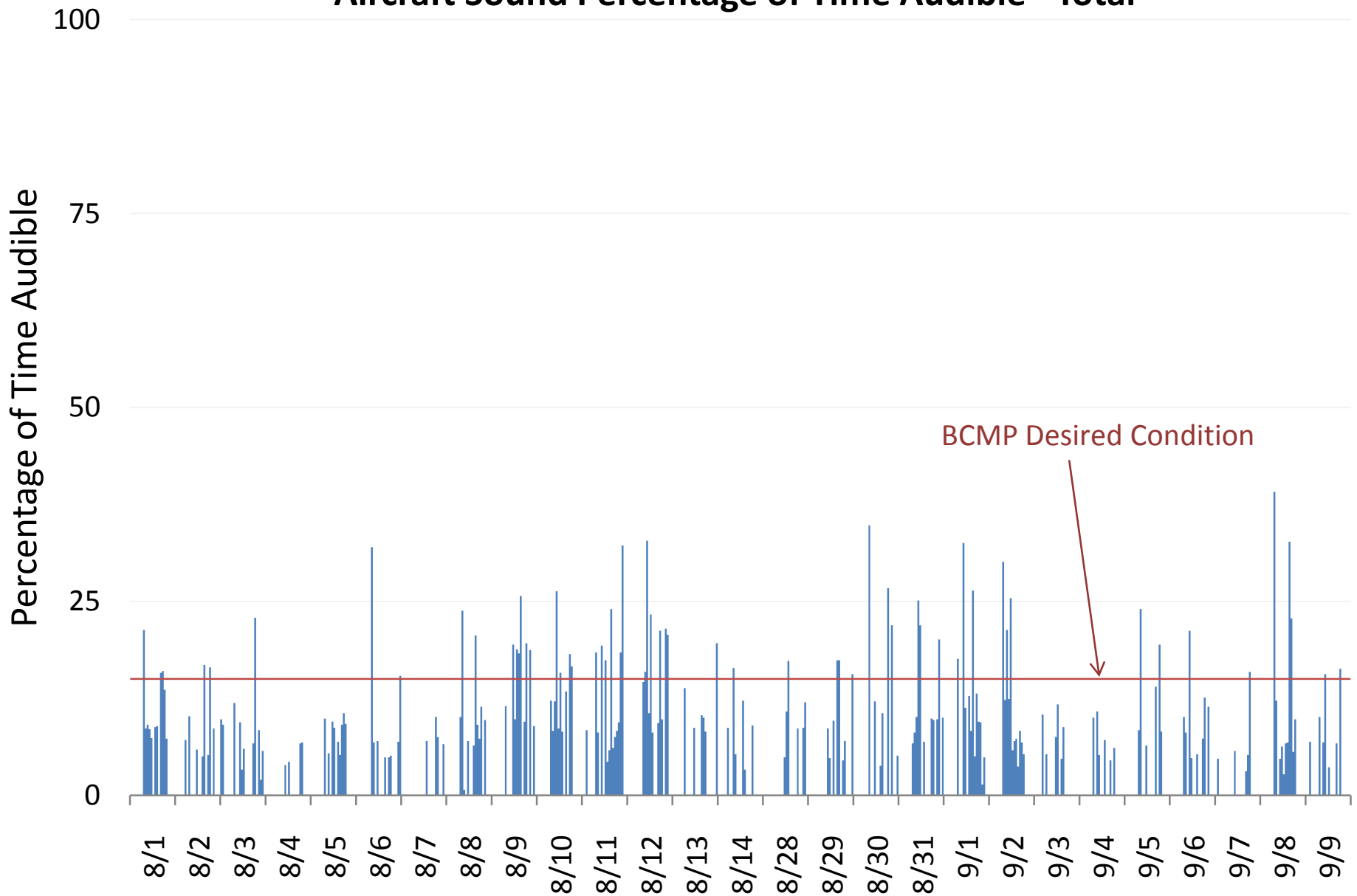
Map of Sampling Locations, 2011



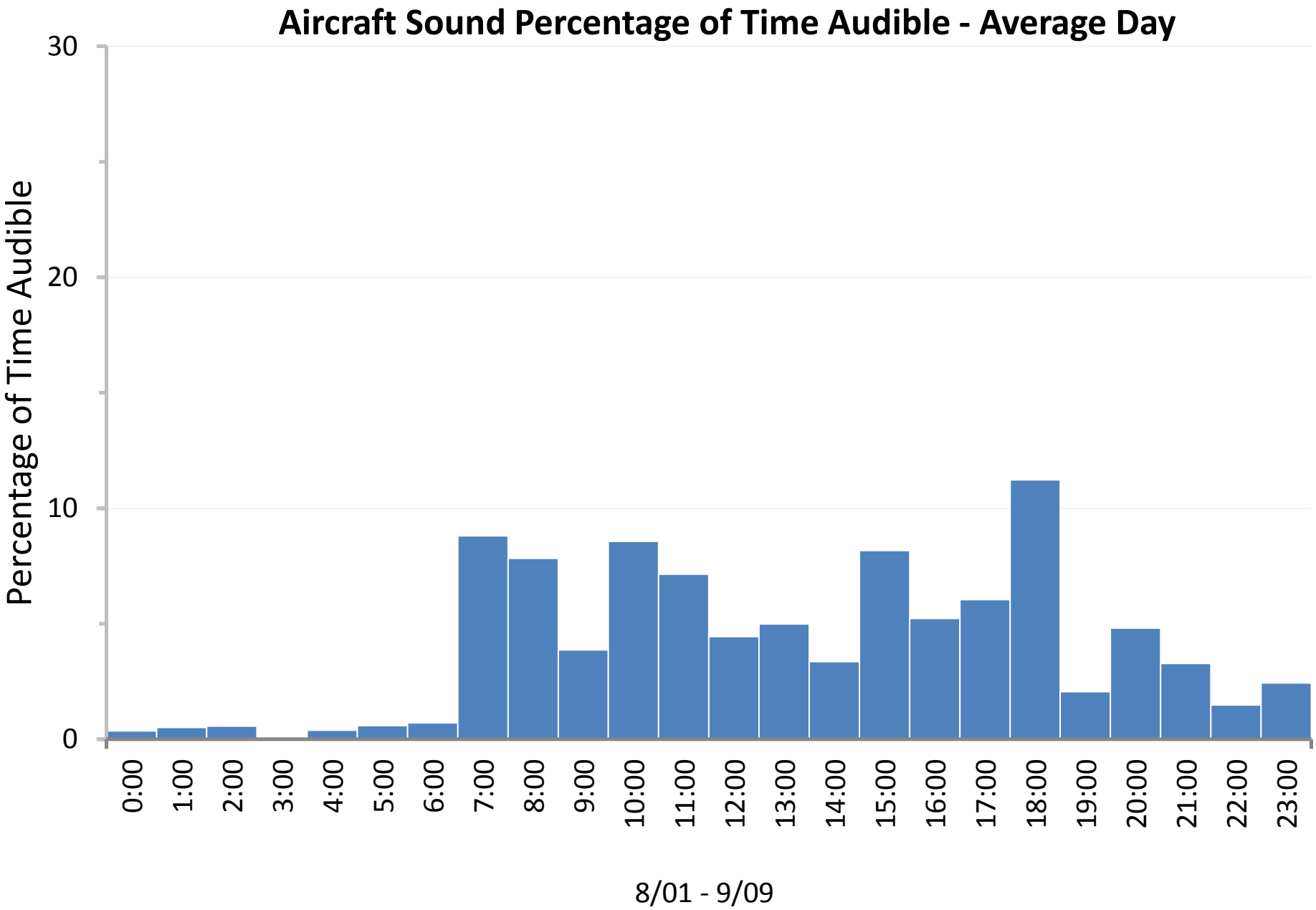
Estok / ESTO



2011 Estok

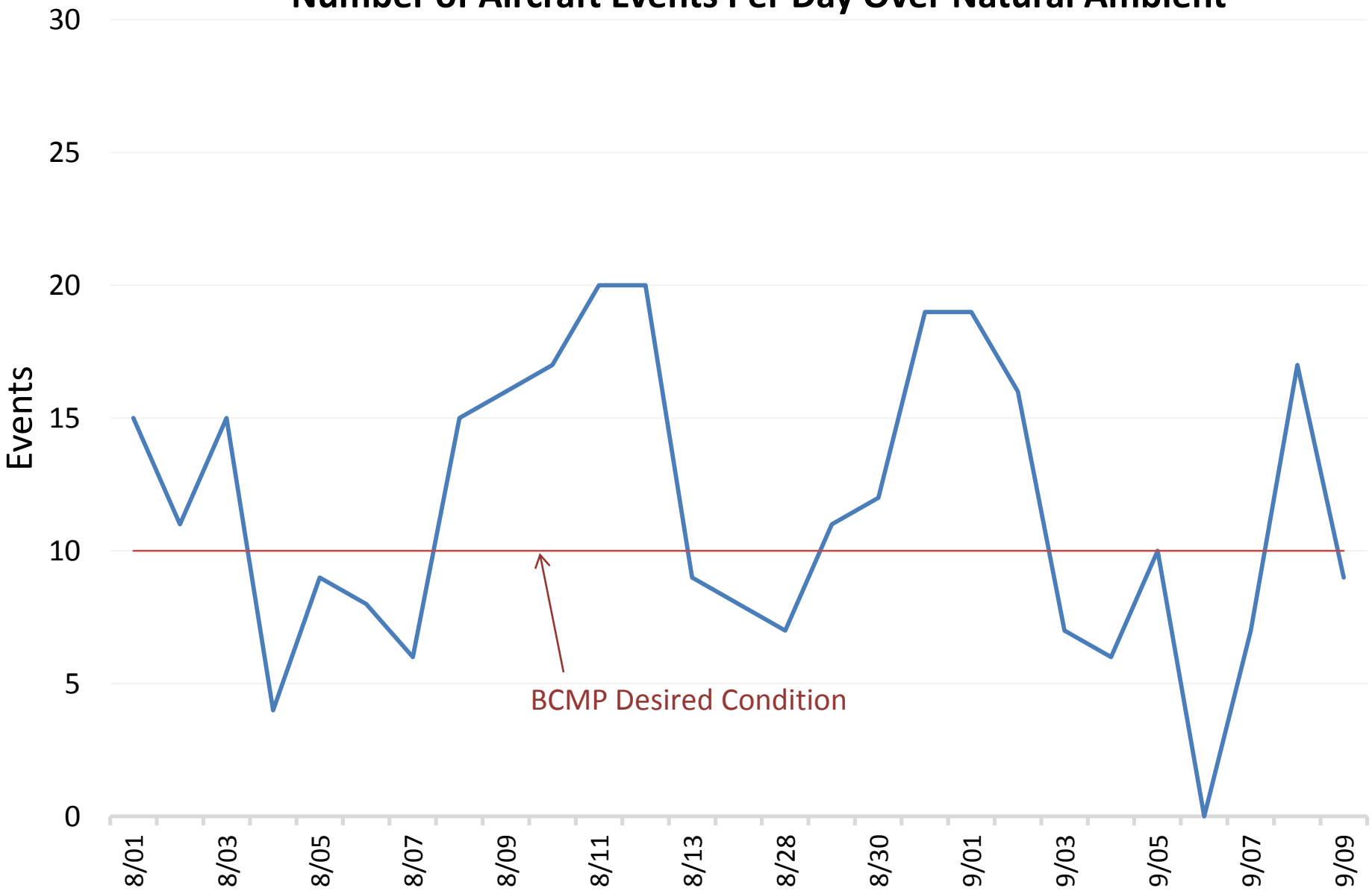

Aircraft Sound Percentage of Time Audible - Total
Percentage of Time Audible
100
75
50
25
0
BCMP Desired Condition
8/1
8/2
8/3
8/4
8/5
8/6
8/7
8/8
8/9
8/10
8/11
8/12
8/13
8/14
8/28
8/29
8/30
8/31
9/1
9/2
9/3
9/4
9/5
9/6
9/7
9/8
9/9

2011 Estok

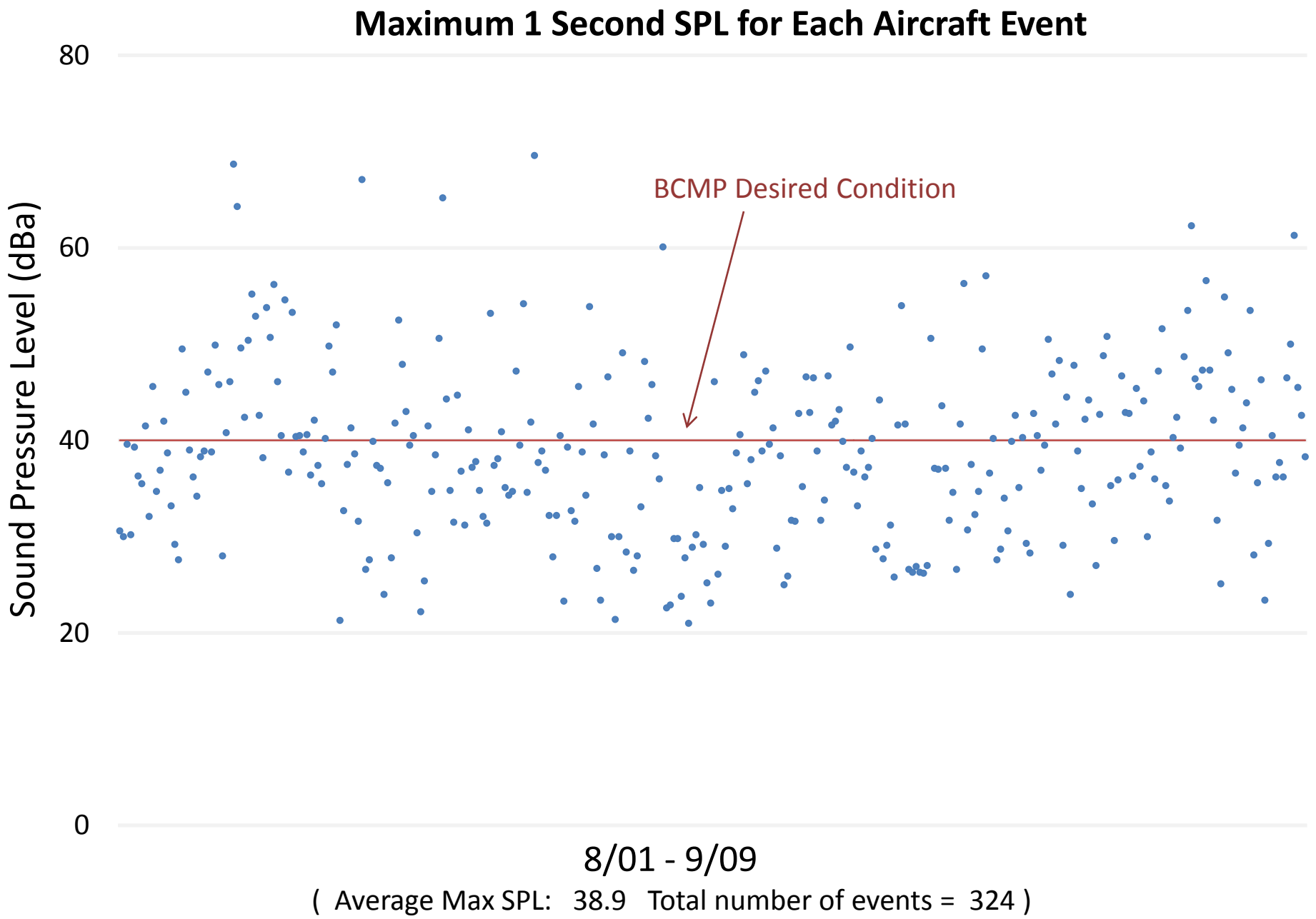

Aircraft Sound Percentage of Time Audible - Average Day
Percentage of Time Audible
30
20
10
0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
8/01 - 9/09

2011 Estok

Number of Aircraft Events Per Day Over Natural Ambient



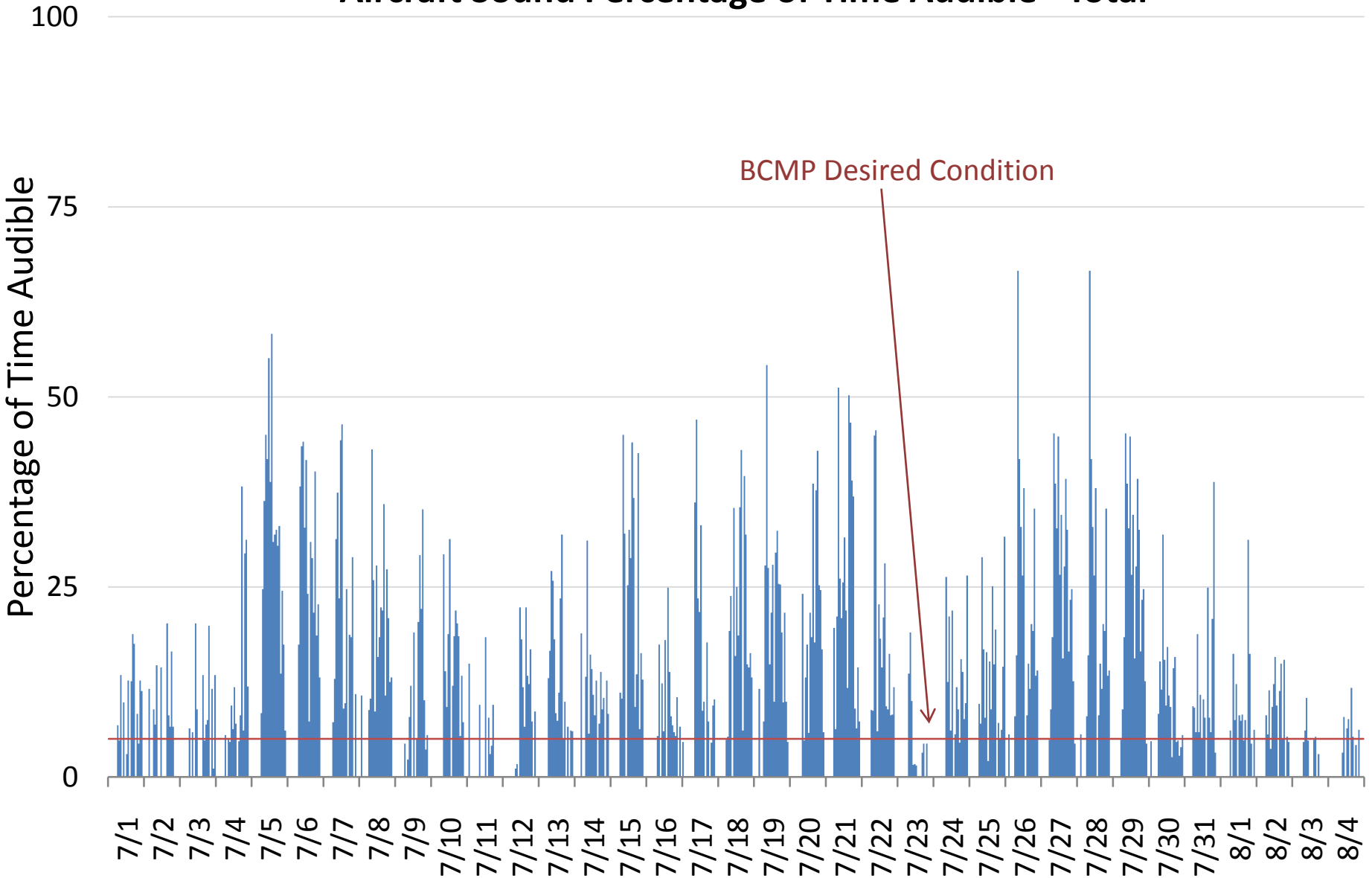
2011 Estok


Maximum 1 Second SPL for Each Aircraft Event
80
60
40
20
0
Sound Pressure Level (dBa)
BCMP Desired Condition
8/01 - 9/09
(Average Max SPL: 38.9 Total number of events = 324)

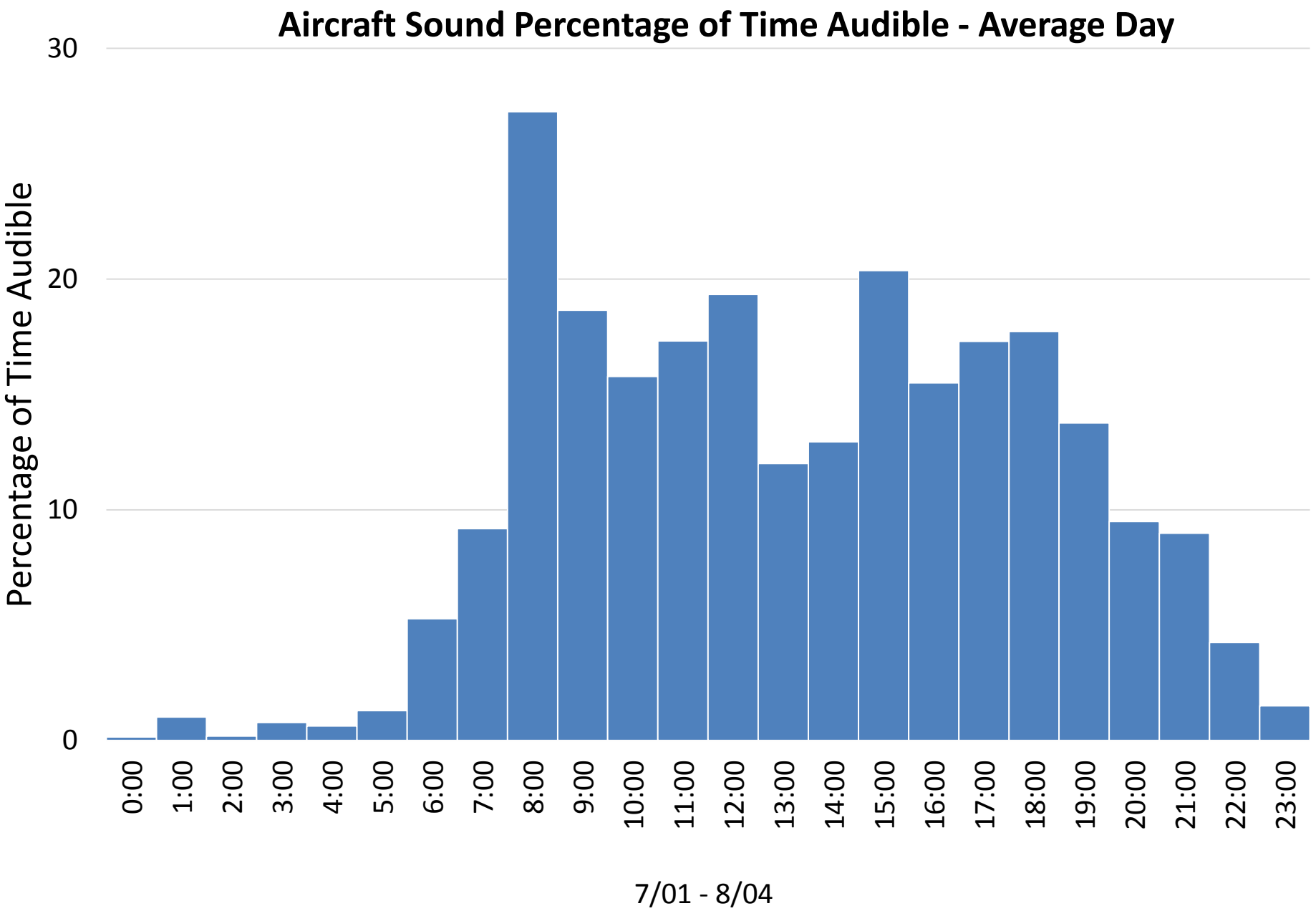
Fang Mountain / FANG

2011 Fang Mountain

Aircraft Sound Percentage of Time Audible - Total

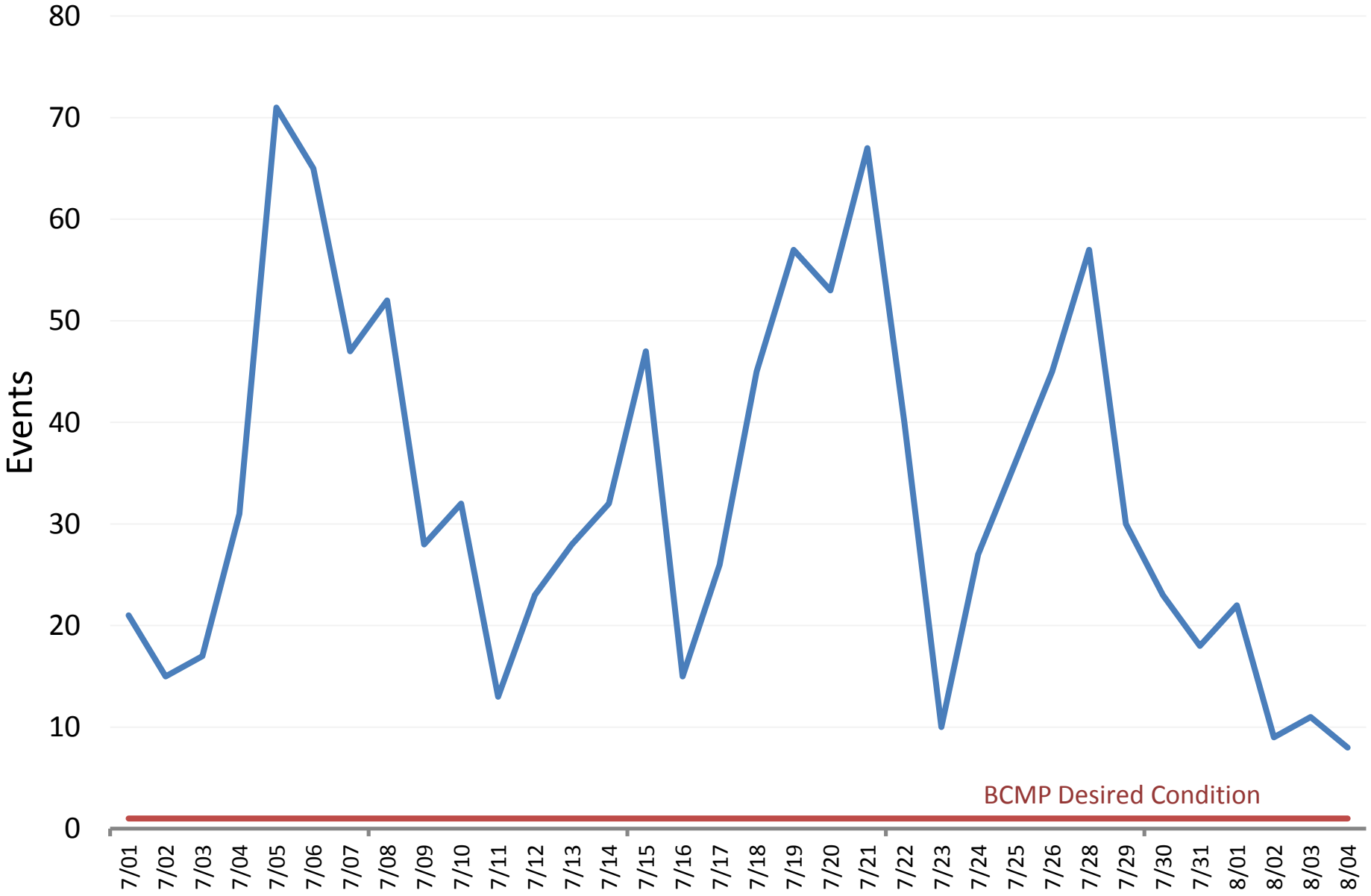


2011 Fang Mountain



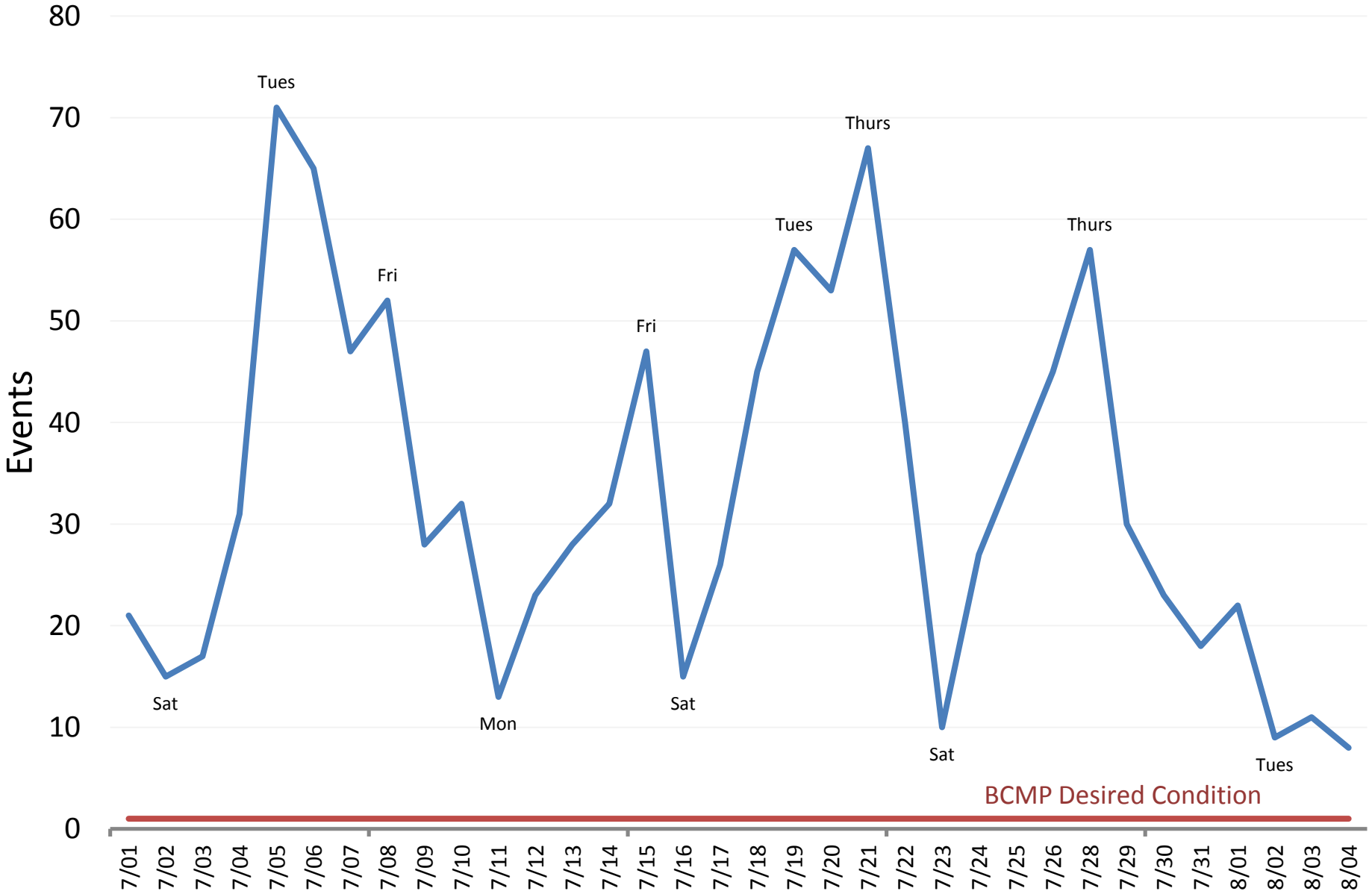
2011 Fang Mountain

Number of Aircraft Events Per Day Over Natural Ambient



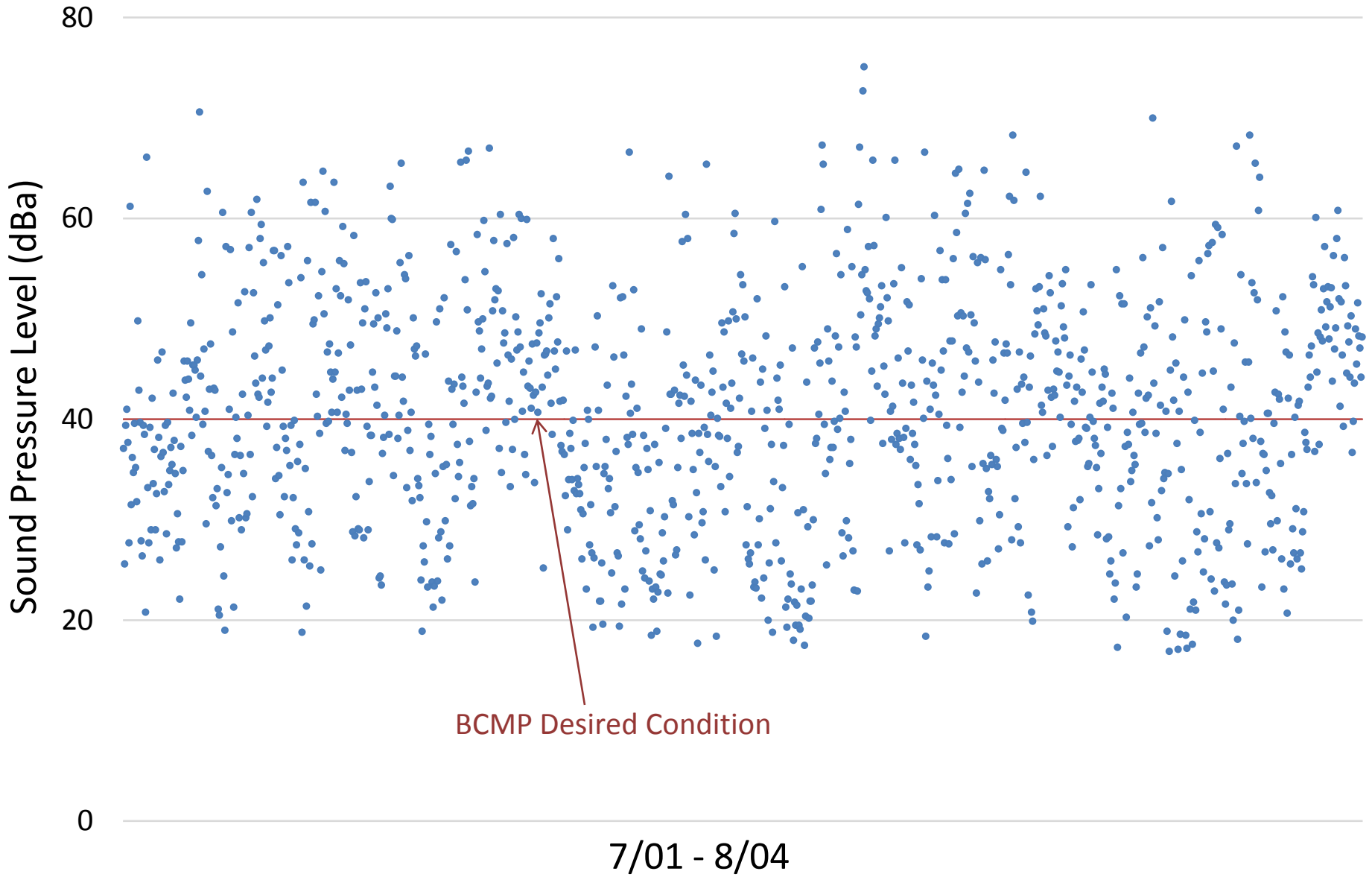
2011 Fang Mountain

Number of Aircraft Events Per Day Over Natural Ambient



2011 Fang Mountain

Maximum 1 Second SPL for Each Aircraft Event



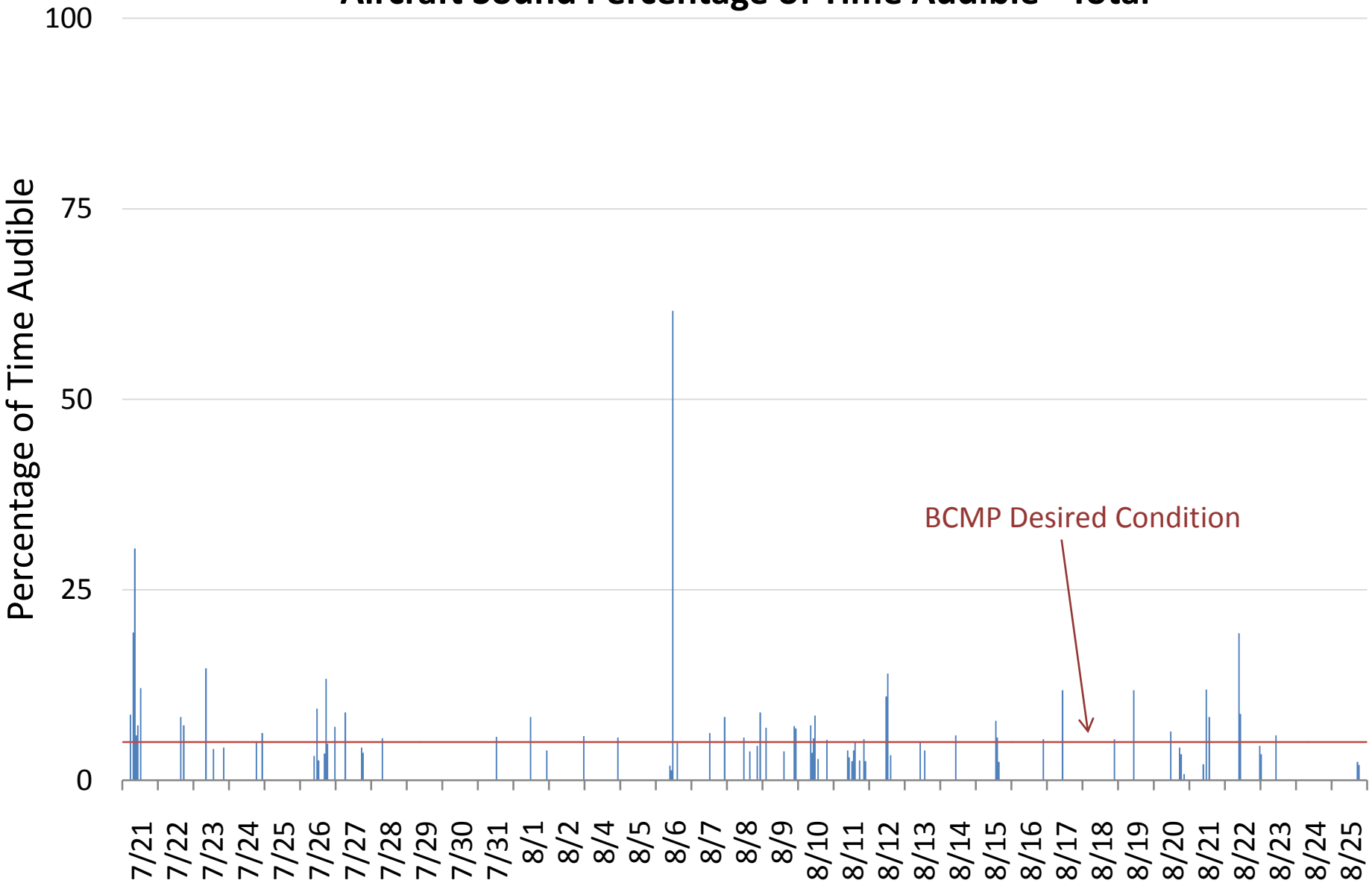
7/01 - 8/04

(Average Max SPL: 40.6 Total Number of Events = 1125)

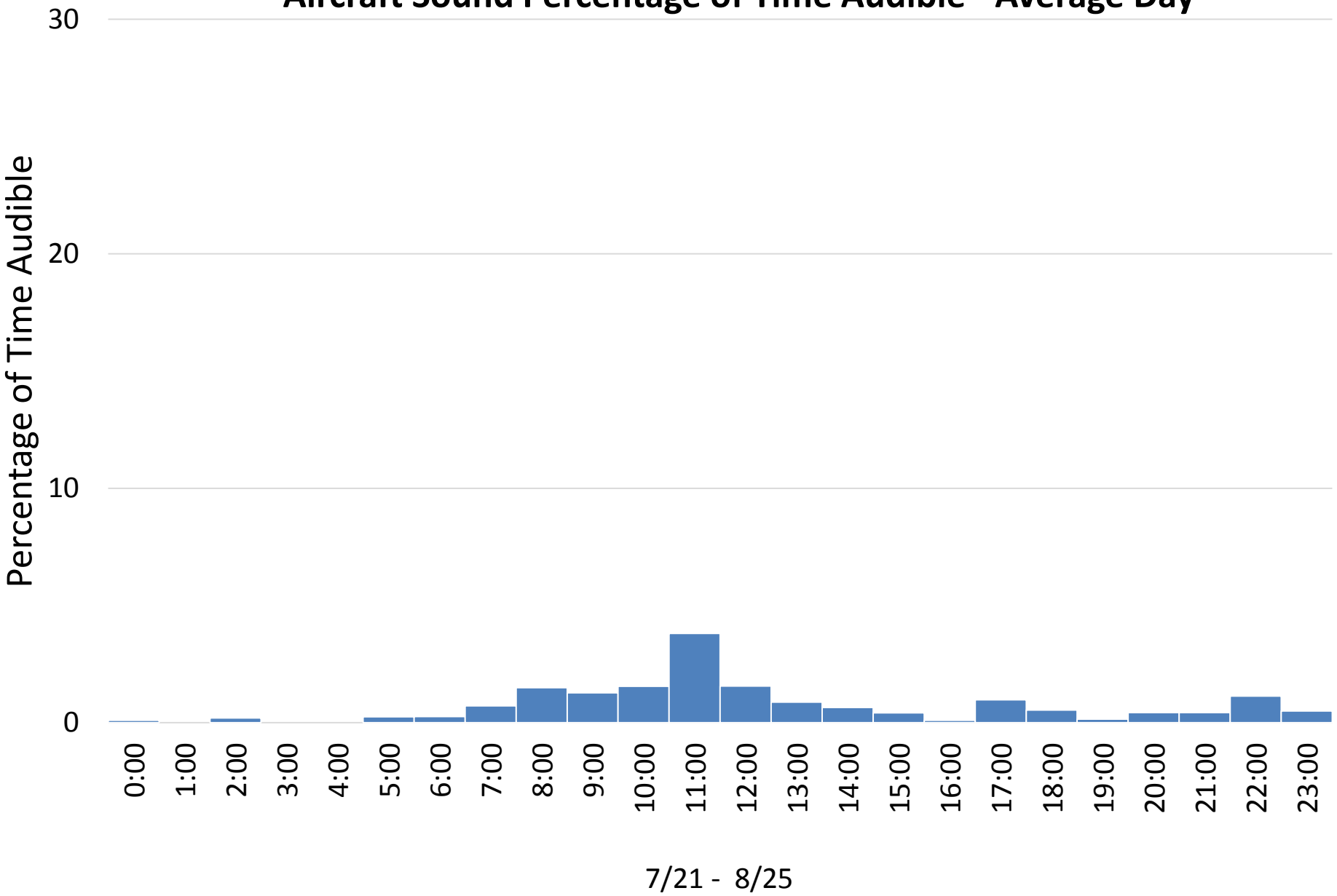
Herron Glacier / HEGL

2011 Herron Glacier

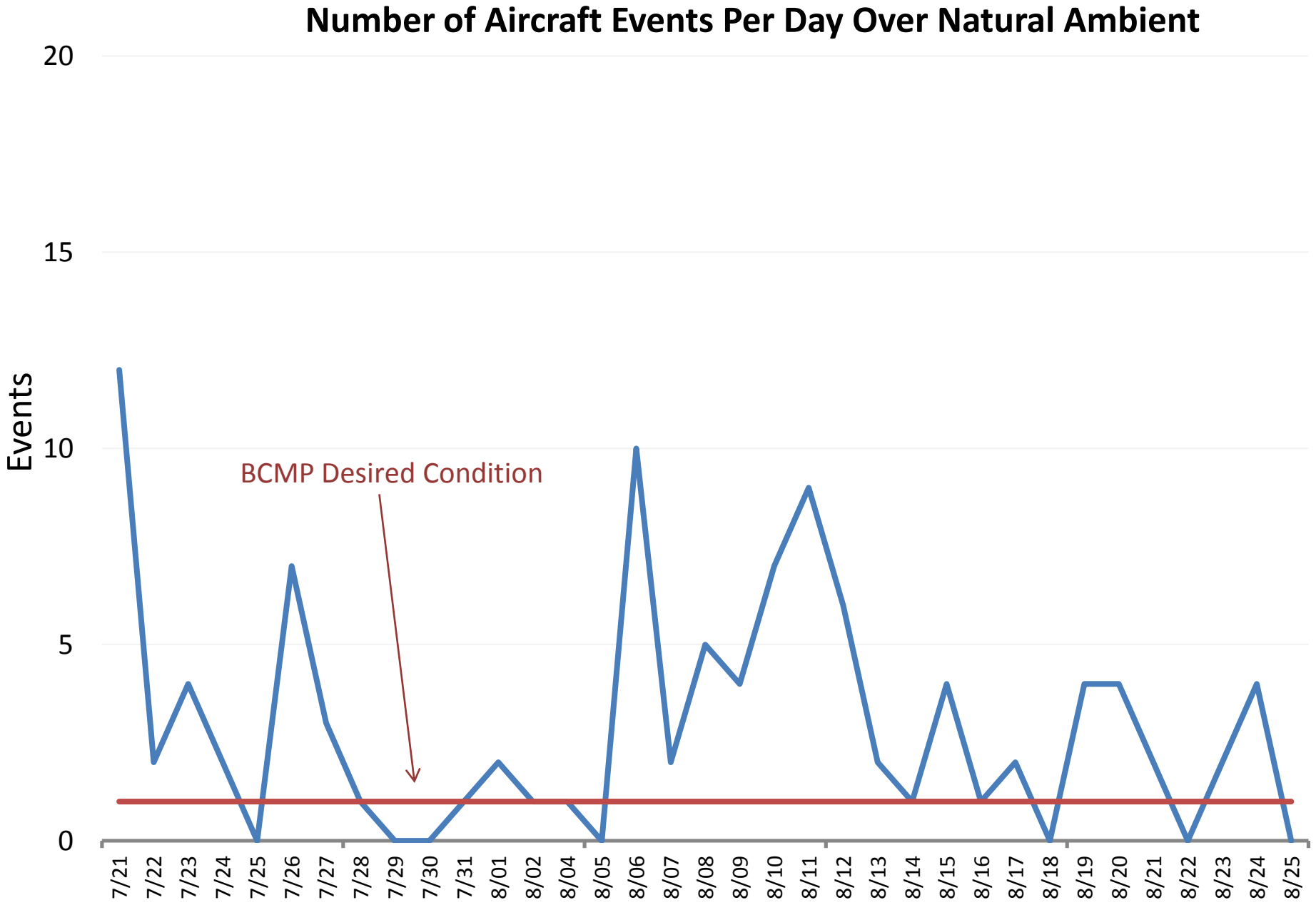
Aircraft Sound Percentage of Time Audible - Total



2011 Herron Glacier

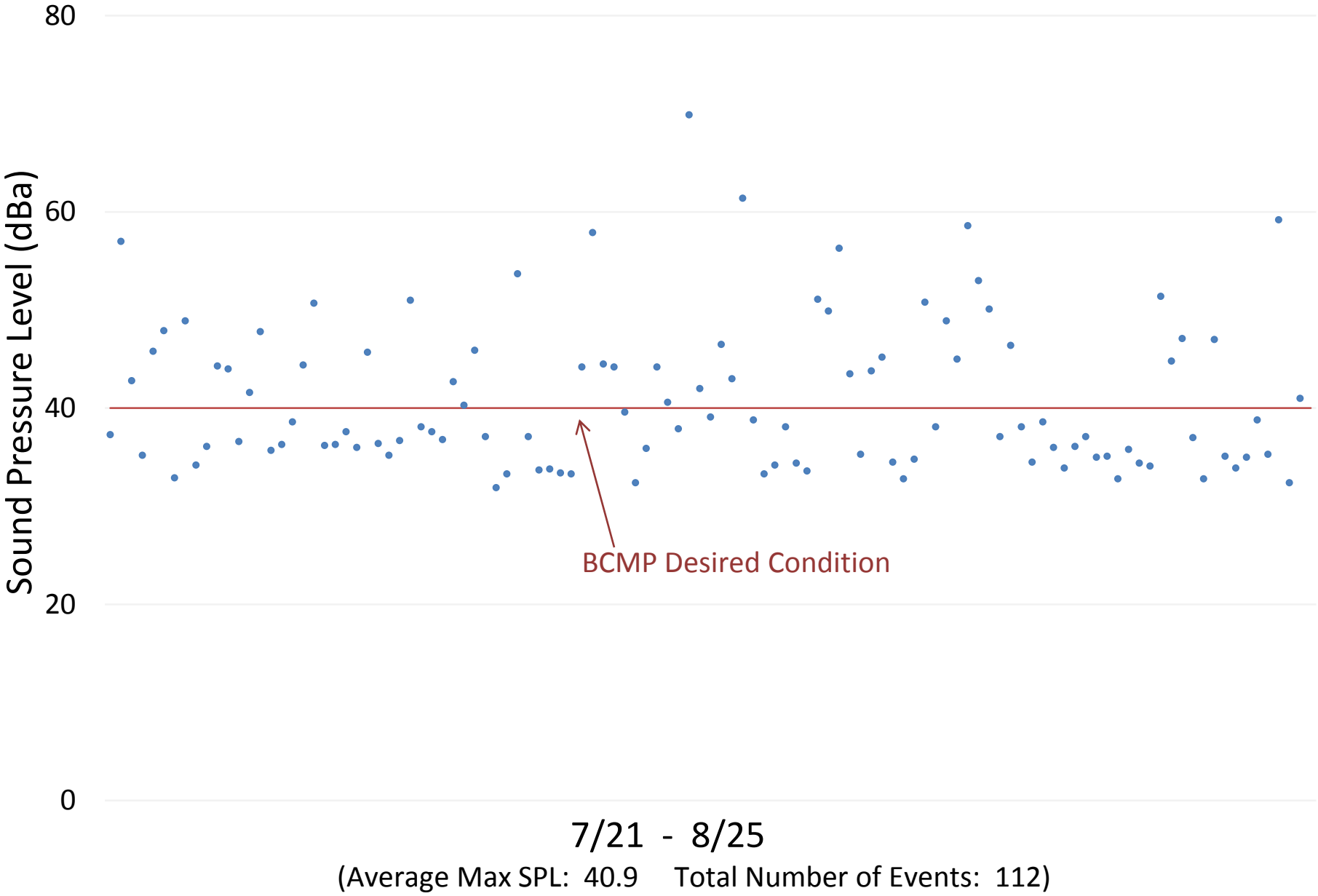


2011 Herron Glacier



2011 Herron Glacier

Maximum 1 Second SPL for Each Aircraft Event



7/21 - 8/25

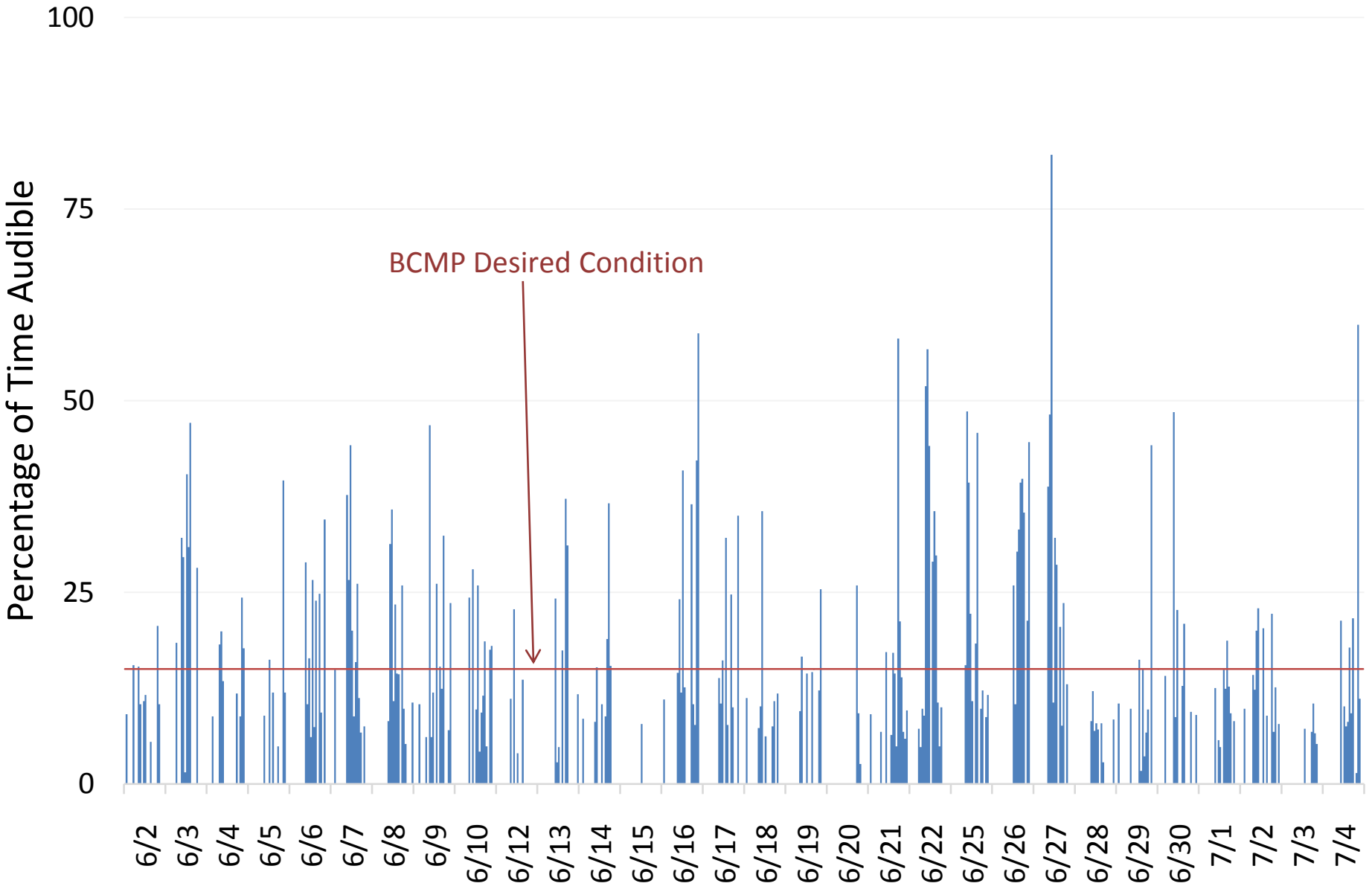
(Average Max SPL: 40.9 Total Number of Events: 112)

McKinley Bar Trail / MBAR

Note: This site is in the 'Backcountry Hiker' management zone.
(See Table 1. of the Backcountry Management Plan, pg. 32)
The standards at this site are equivalent to a 'Medium' designation.

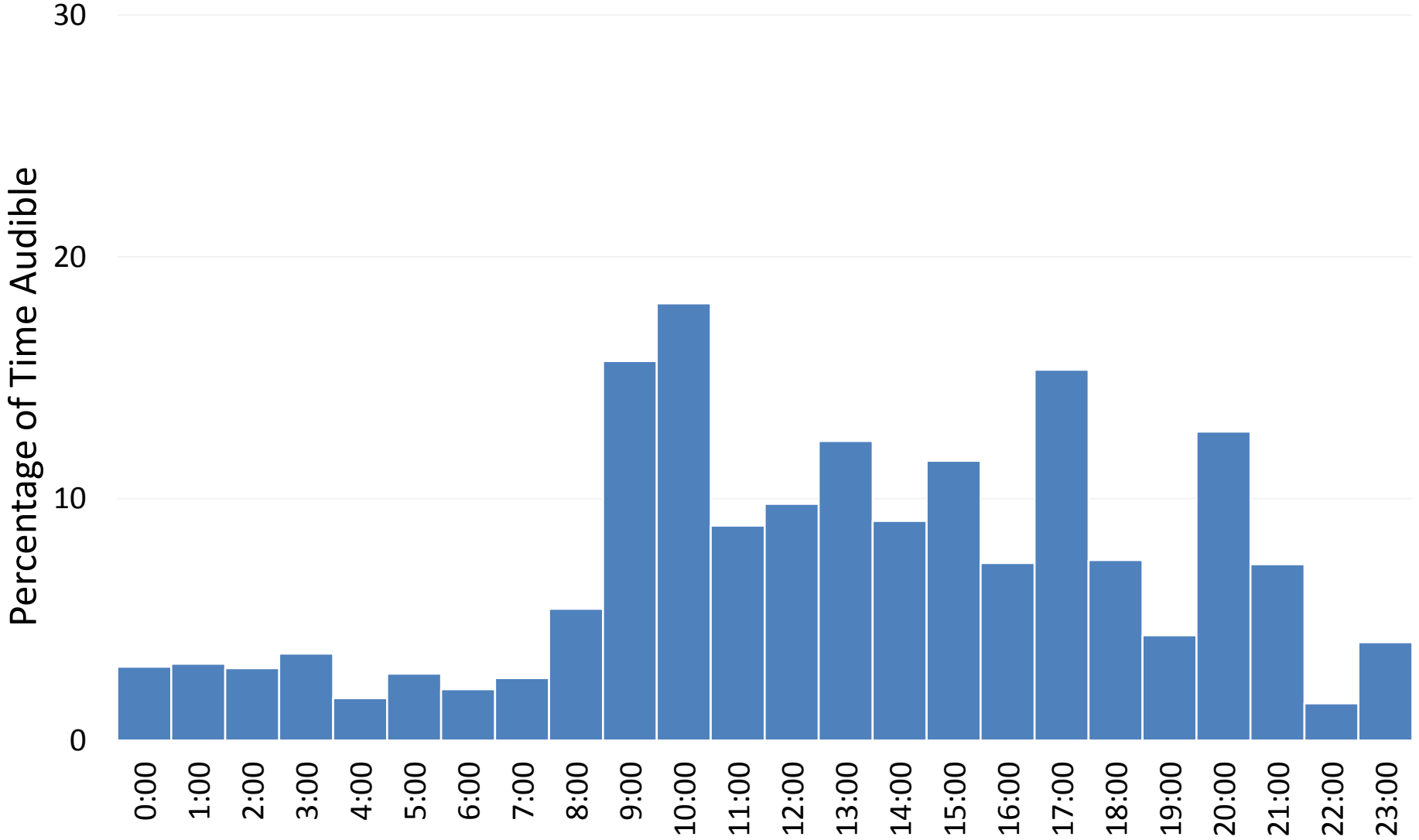
2011 McKinley Bar Trail

Aircraft Sound Percentage of Time Audible - Total



2011 McKinley Bar Trail

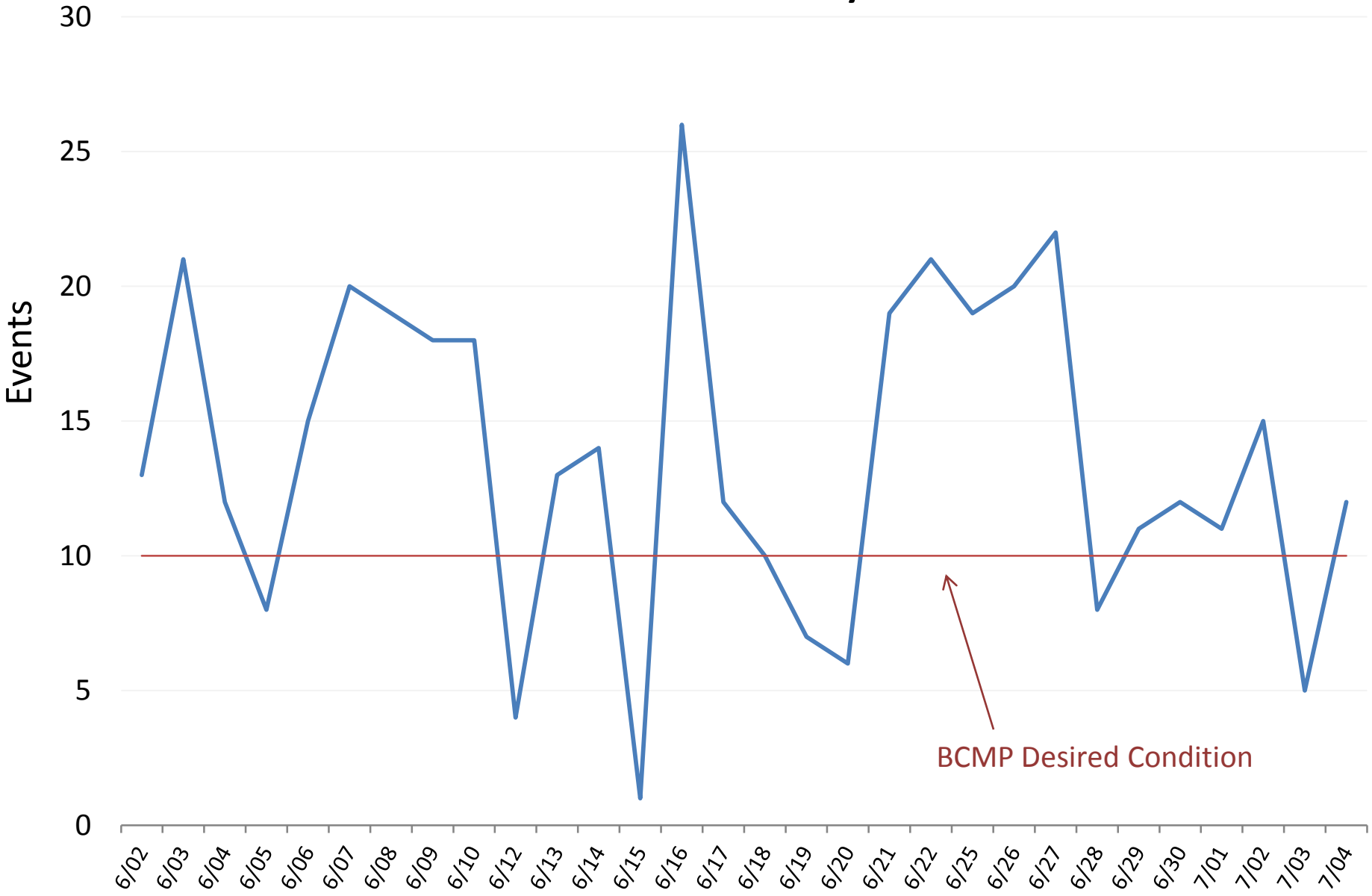
Aircraft Sound Percentage of Time Audible - Average Day



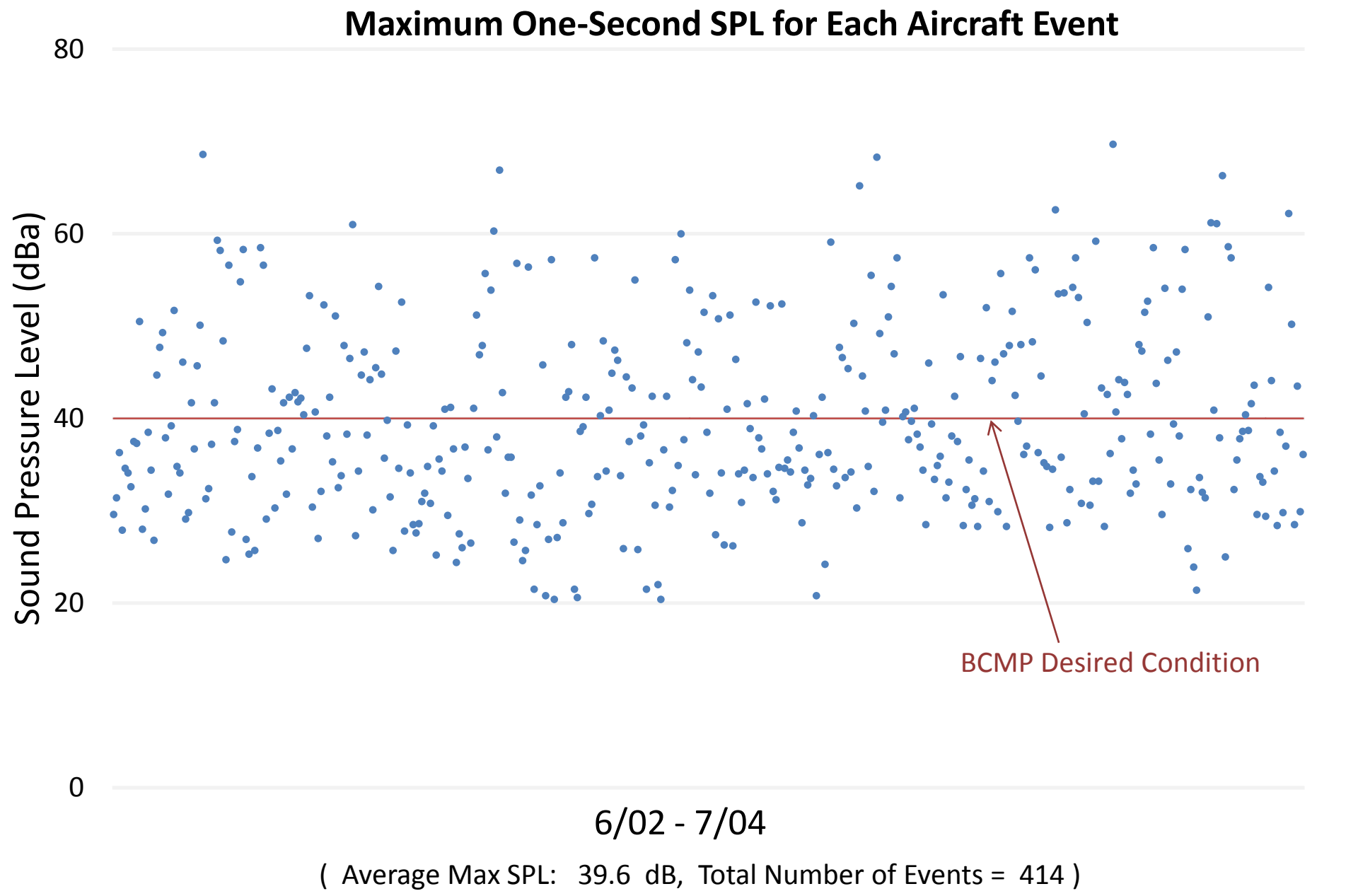
6/02 - 7/04

2011 McKinley Bar Trail

Number of Aircraft Events Per Day Over Natural Ambient

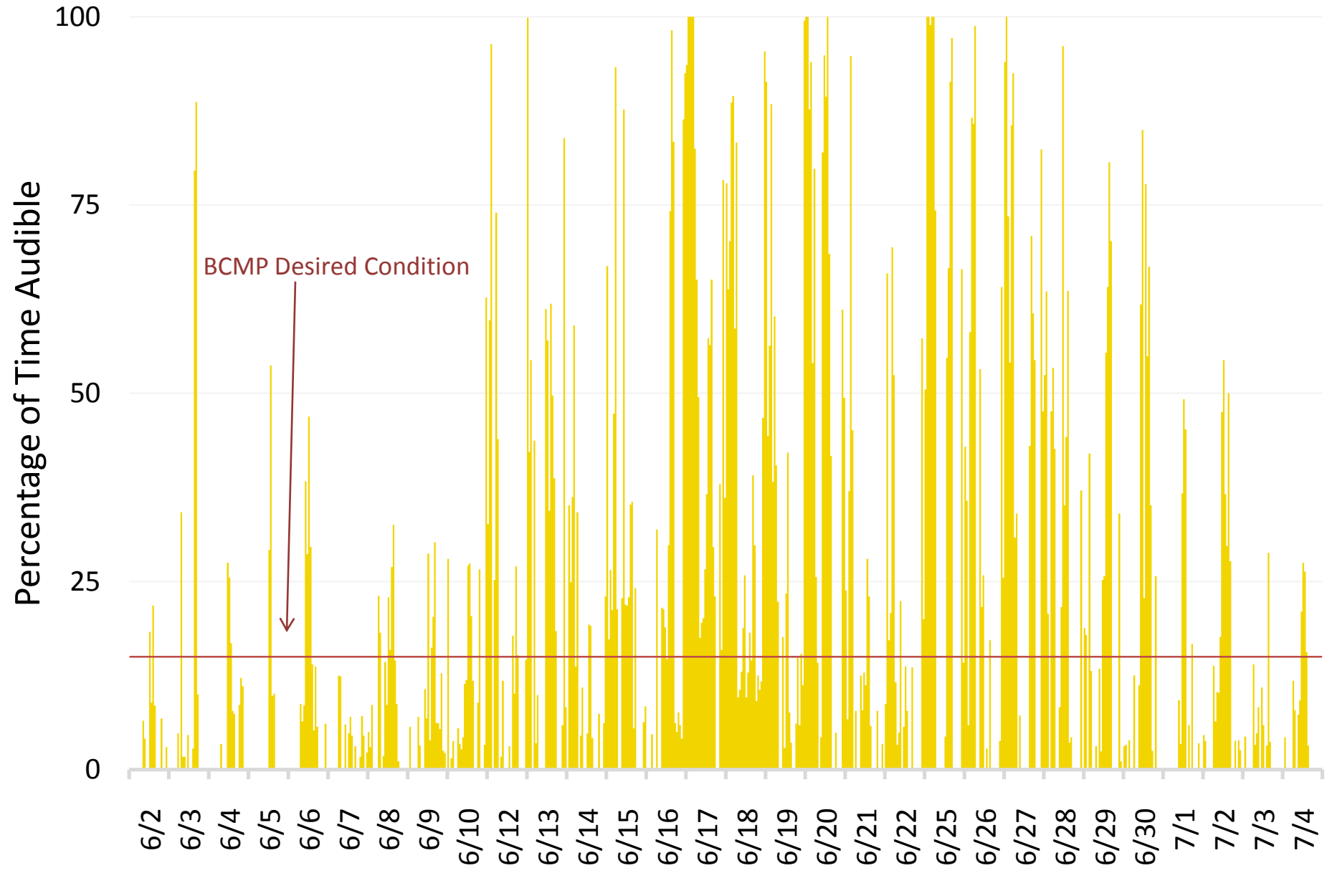


2011 McKinley Bar Trail



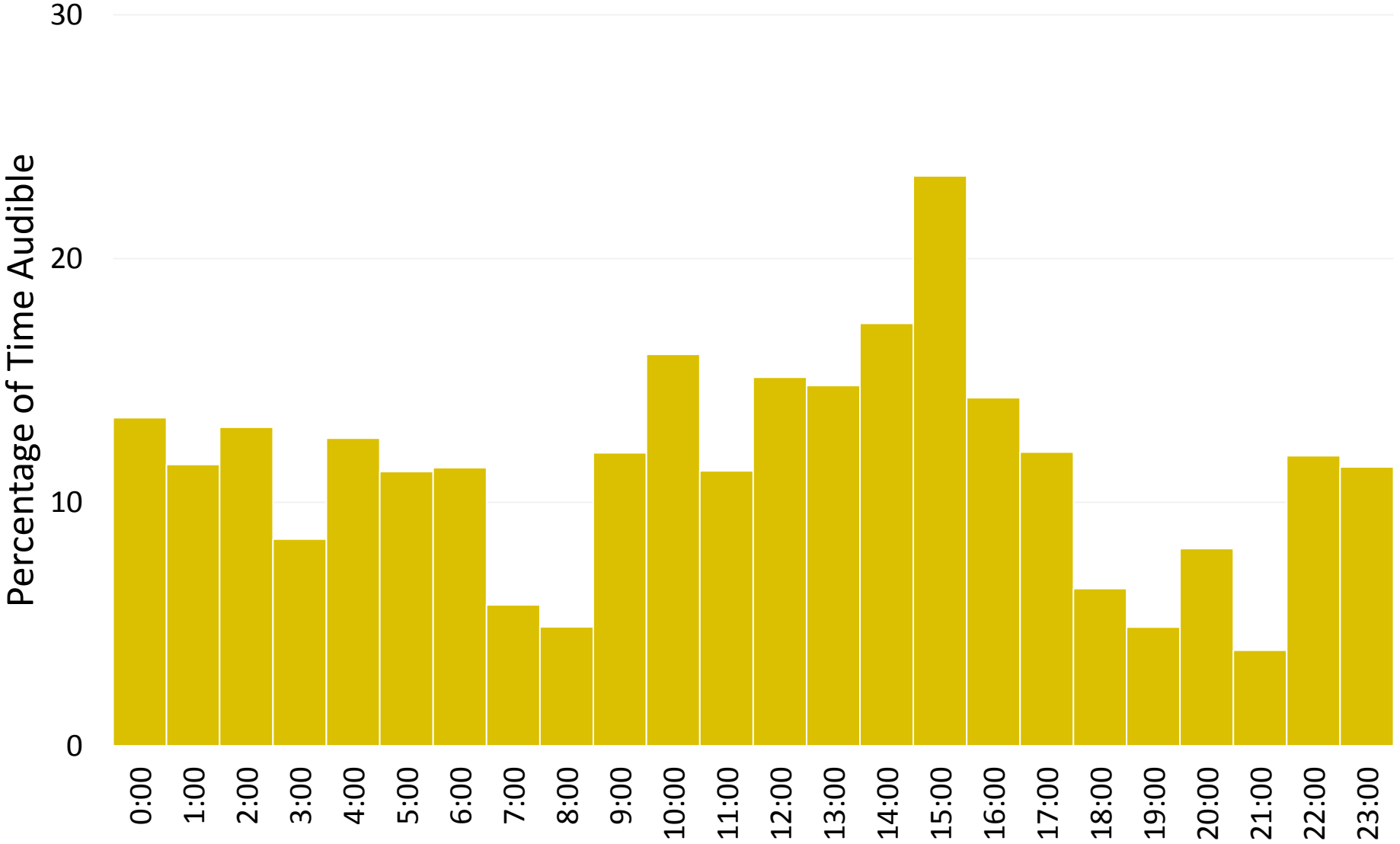
(Average Max SPL: 39.6 dB, Total Number of Events = 414)

2011 McKinley Bar Trail



2011 McKinley Bar Trail

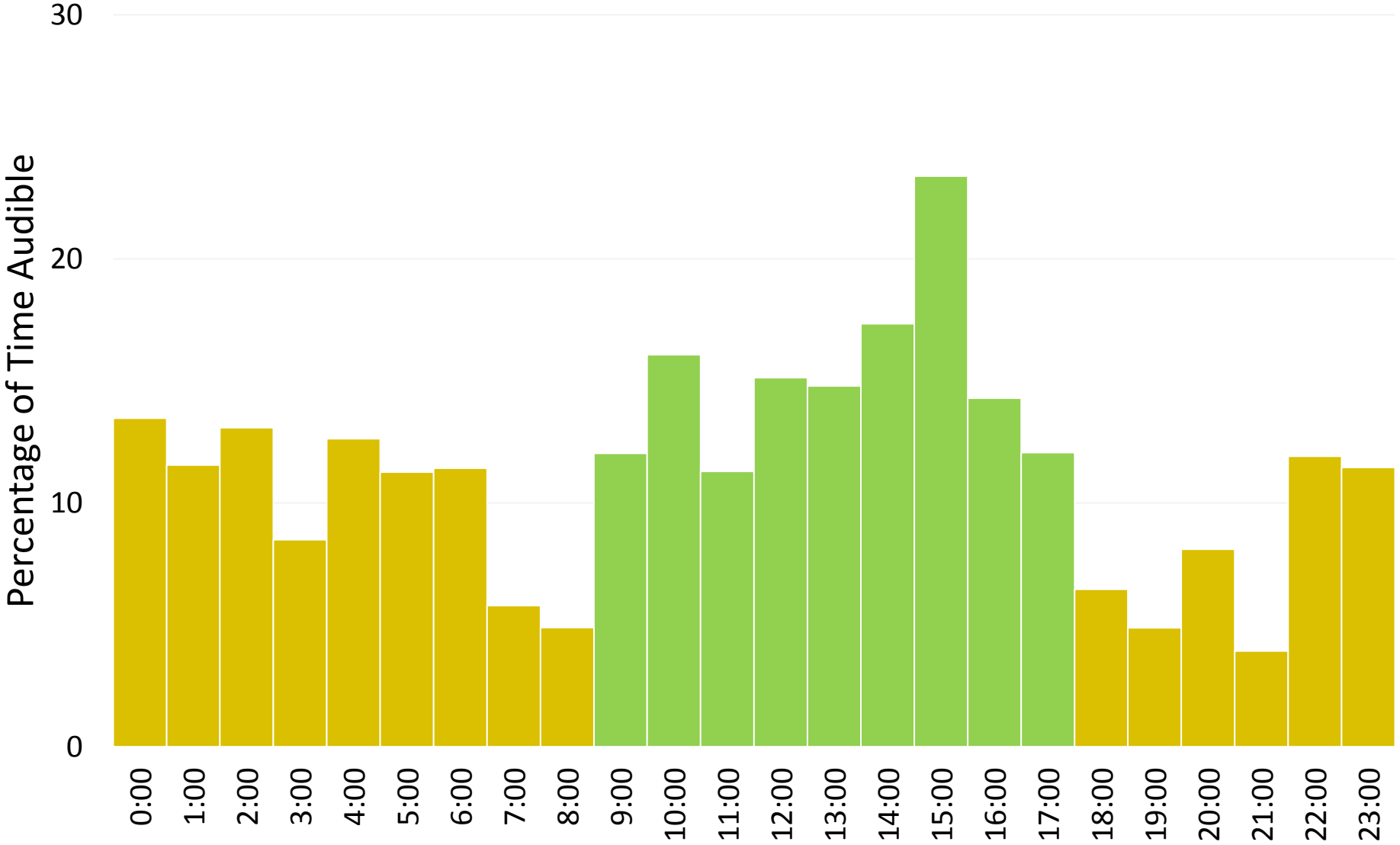
Vehicle Sound Percentage of Time Audible - Average Day



6/02 - 7/04

2011 McKinley Bar Trail

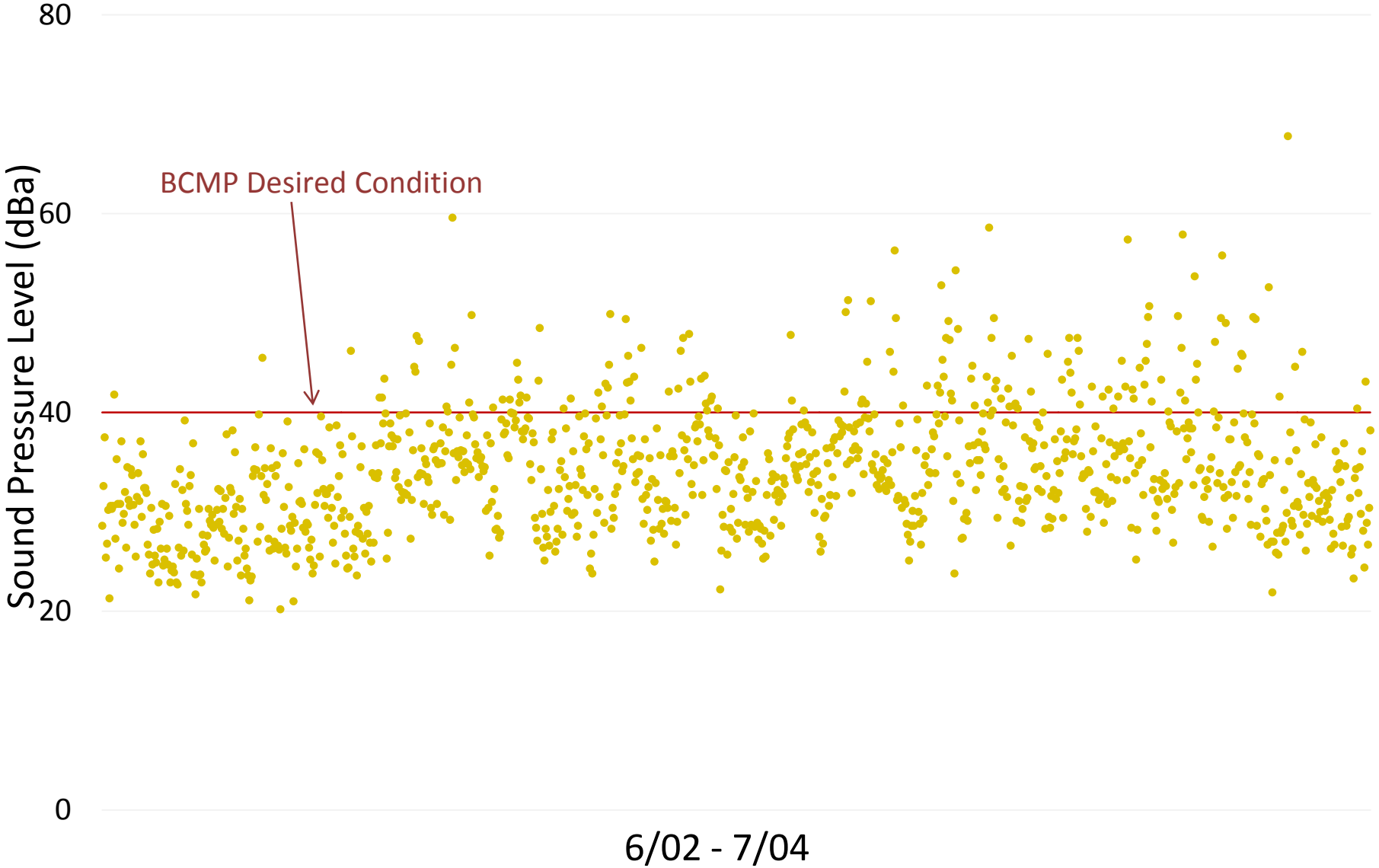
Vehicle Sound Percentage of Time Audible - Average Day



6/02 - 7/04

2011 McKinley Bar Trail

Maximum One-Second SPL for Each Vehicle Event



6/02 - 7/04

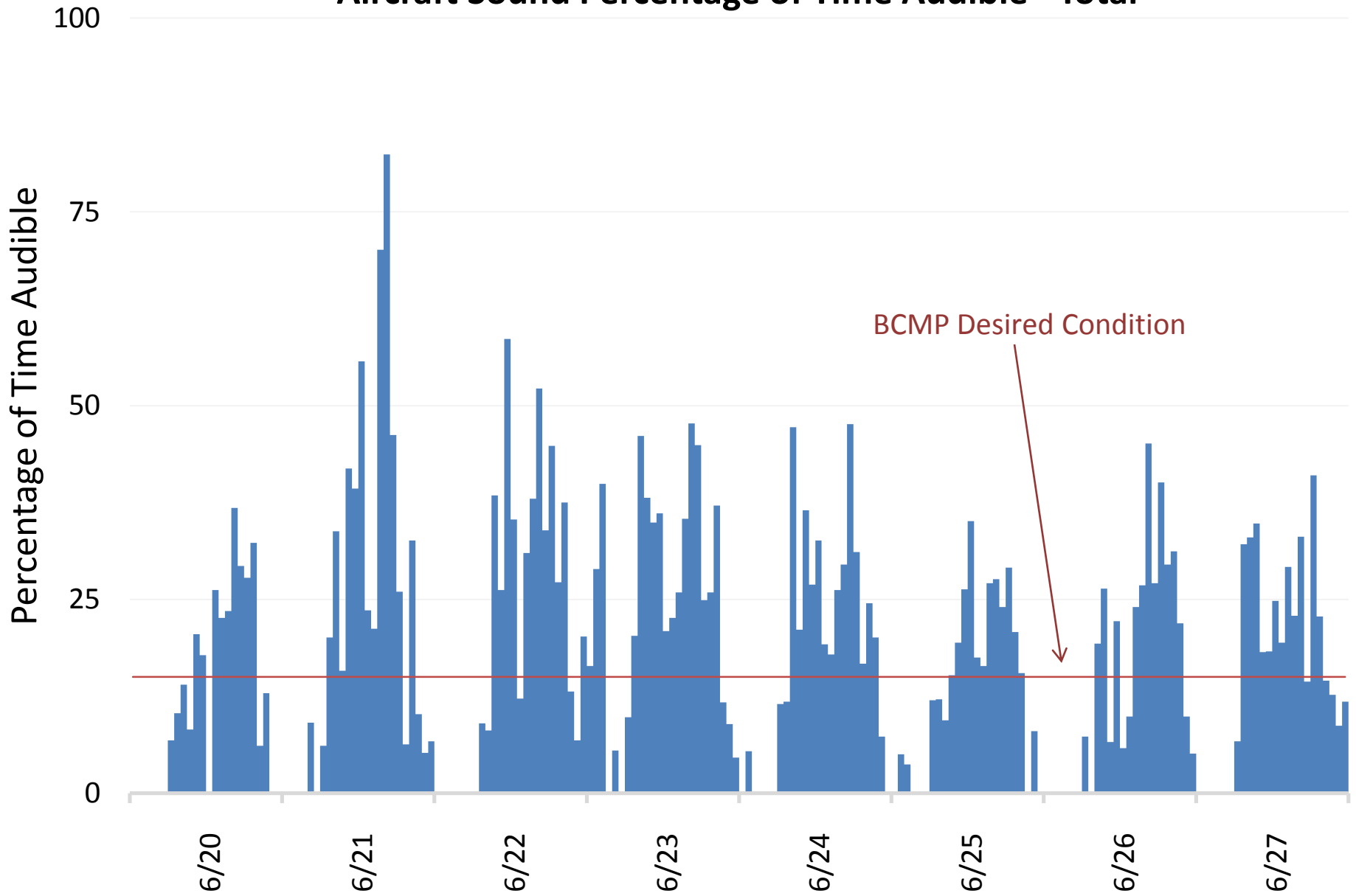
(Average Max SPL: 34.2 dB , Total Number of Events = 1062)

North Triple Lakes Trail / NTRL

Note: This site is in the 'Backcountry Hiker' management zone.
(See Table 1. of the Backcountry Management Plan, pg. 32)
The standards at this site are equivalent to a 'Medium' designation.

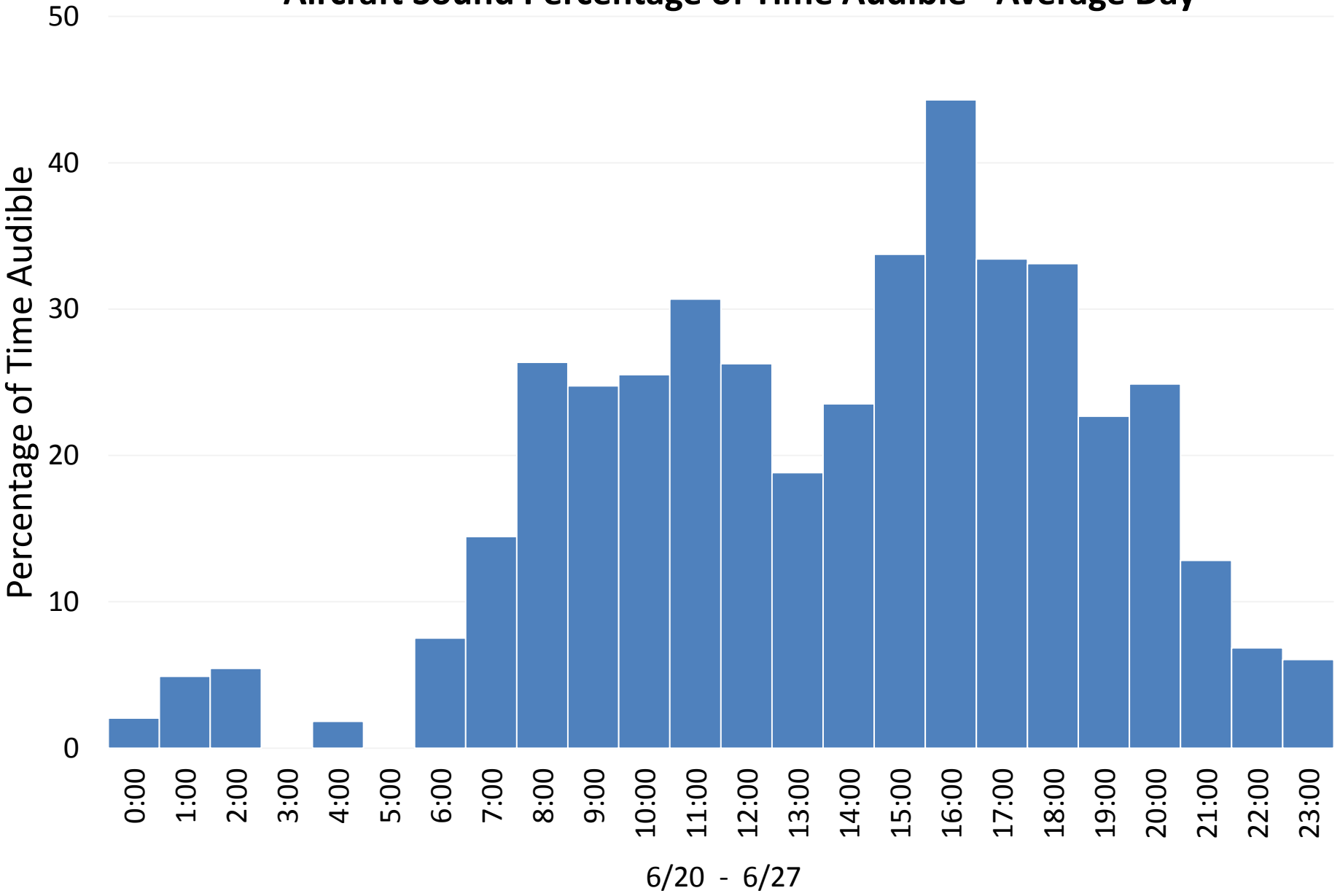
2011 North Triple Lakes Trail

Aircraft Sound Percentage of Time Audible - Total



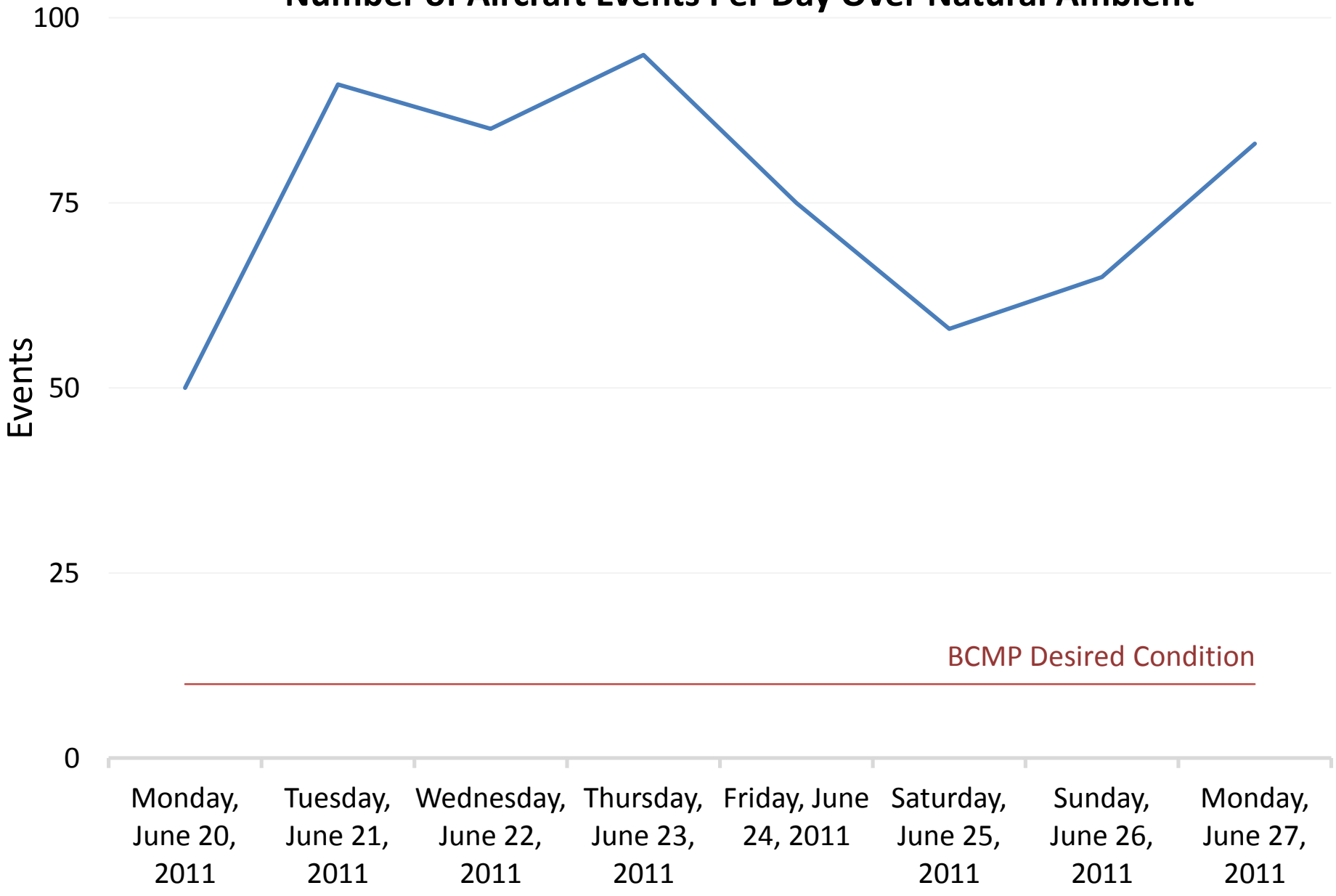
2011 North Triple Lakes Trail

Aircraft Sound Percentage of Time Audible - Average Day

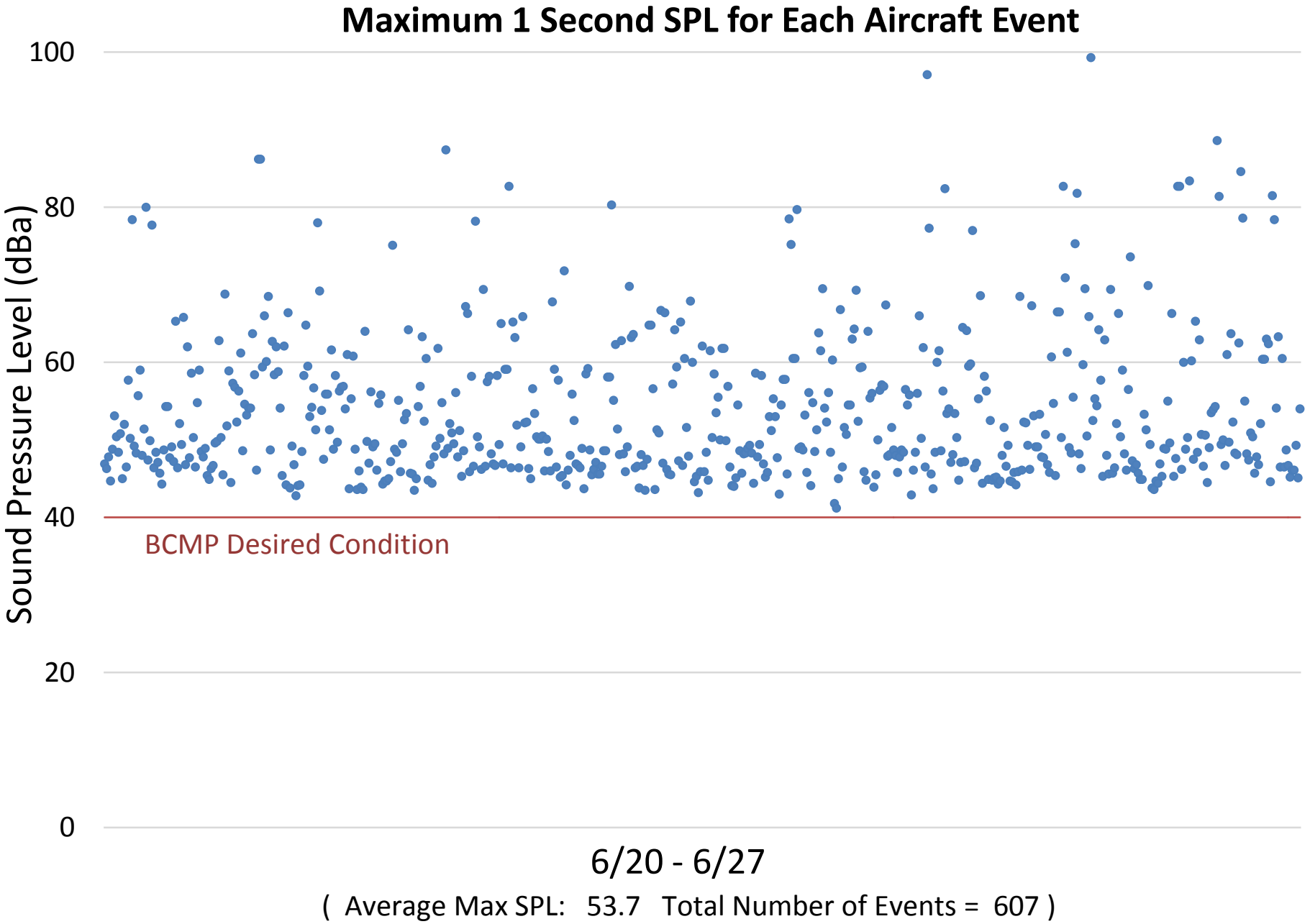


2011 North Triple Lakes Trail

Number of Aircraft Events Per Day Over Natural Ambient

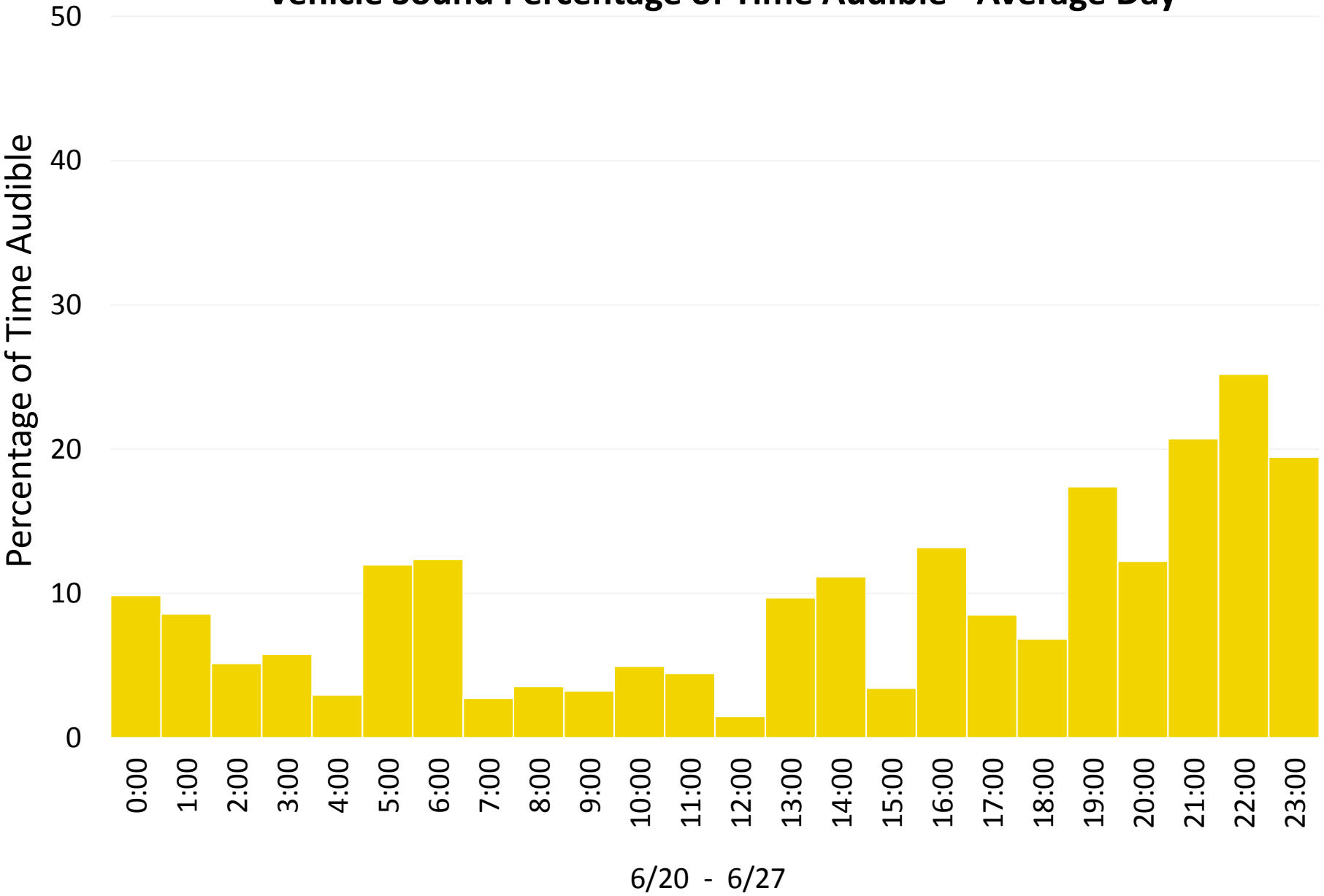


2011 North Triple Lakes Trail



2011 North Triple Lakes Trail

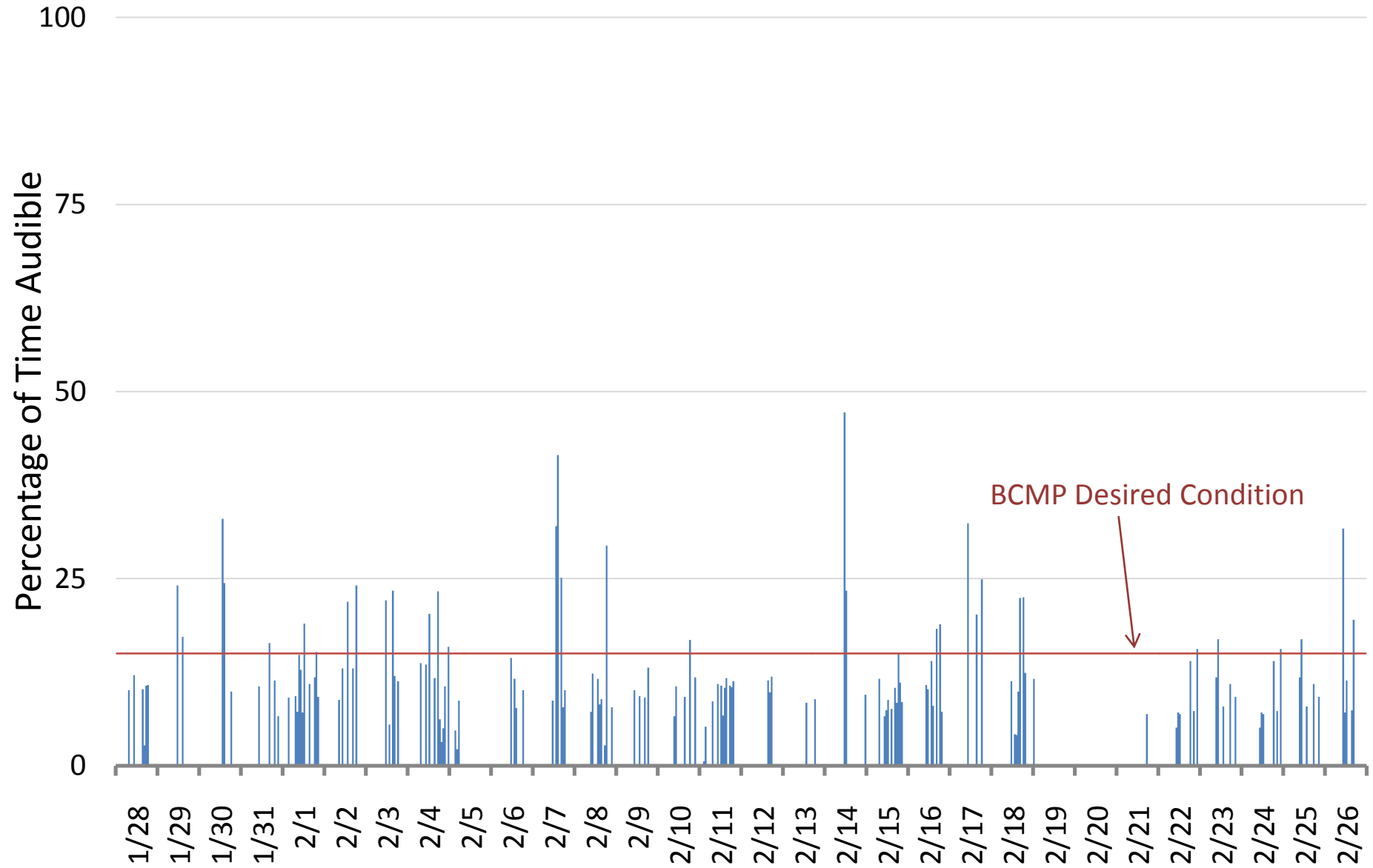
Vehicle Sound Percentage of Time Audible - Average Day



Stampede Airstrip / STAM

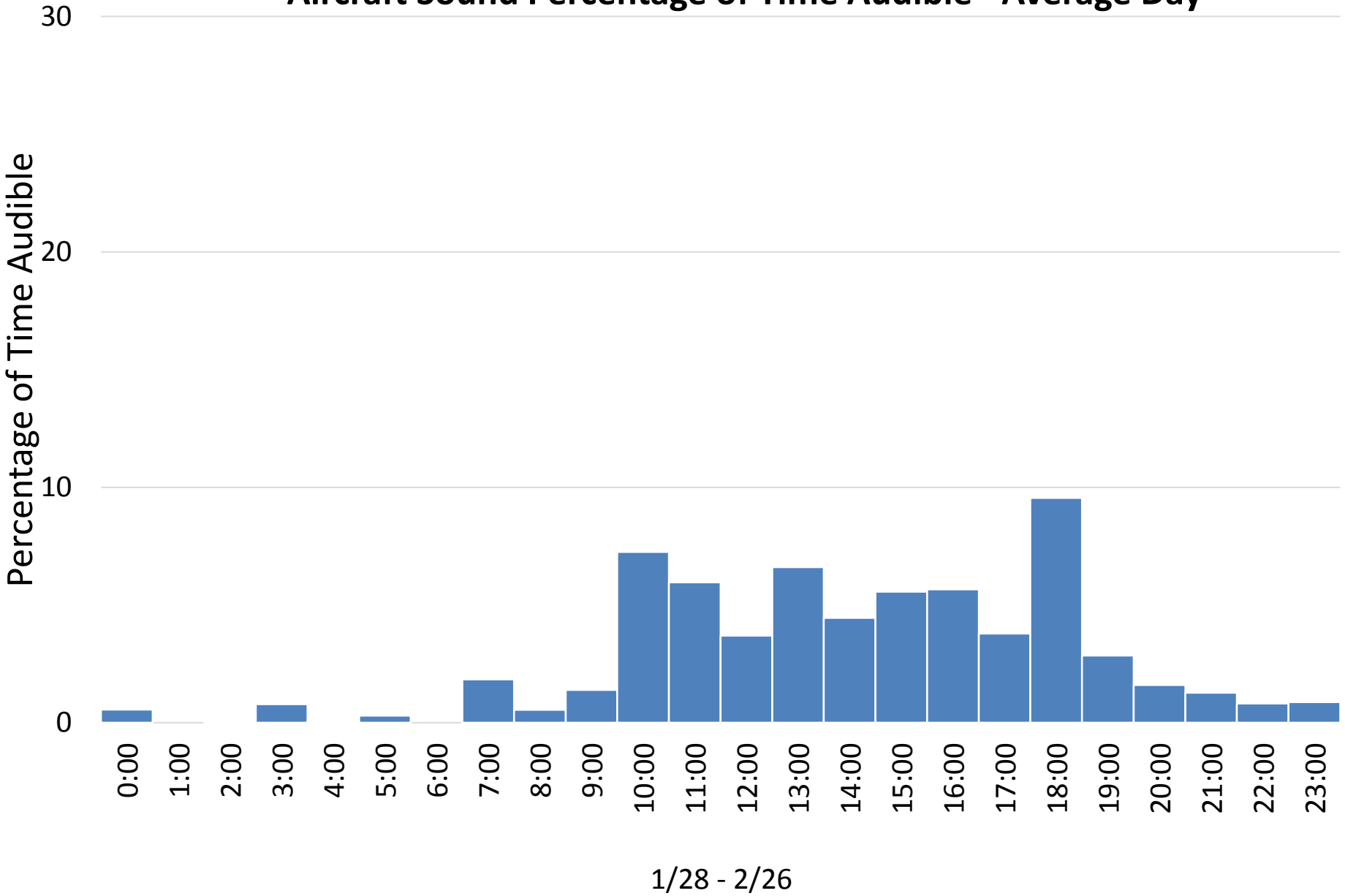
2011 Stampede Airstrip

Aircraft Sound Percentage of Time Audible - Total



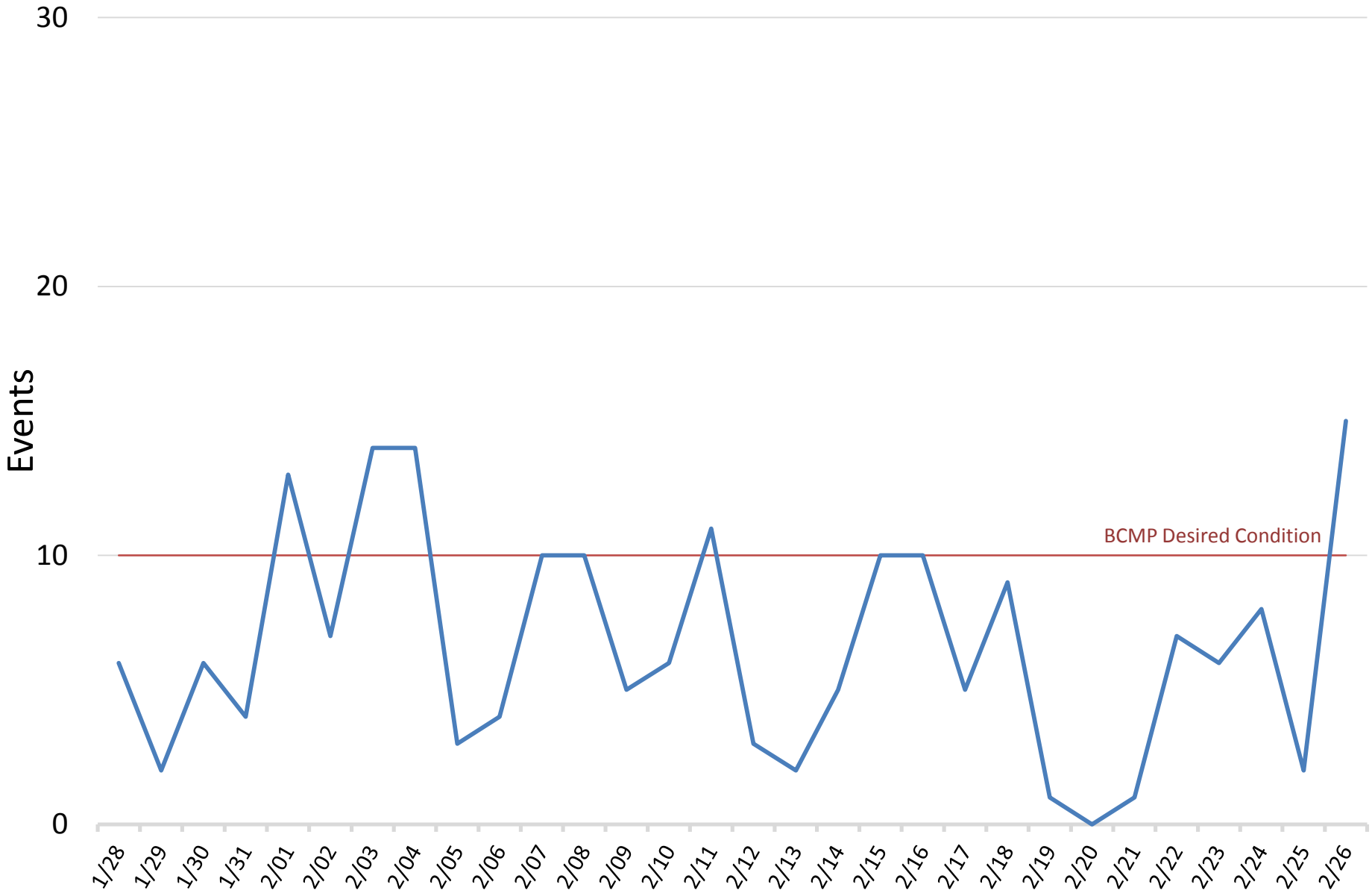
2011 Stampede Airstrip

Aircraft Sound Percentage of Time Audible - Average Day



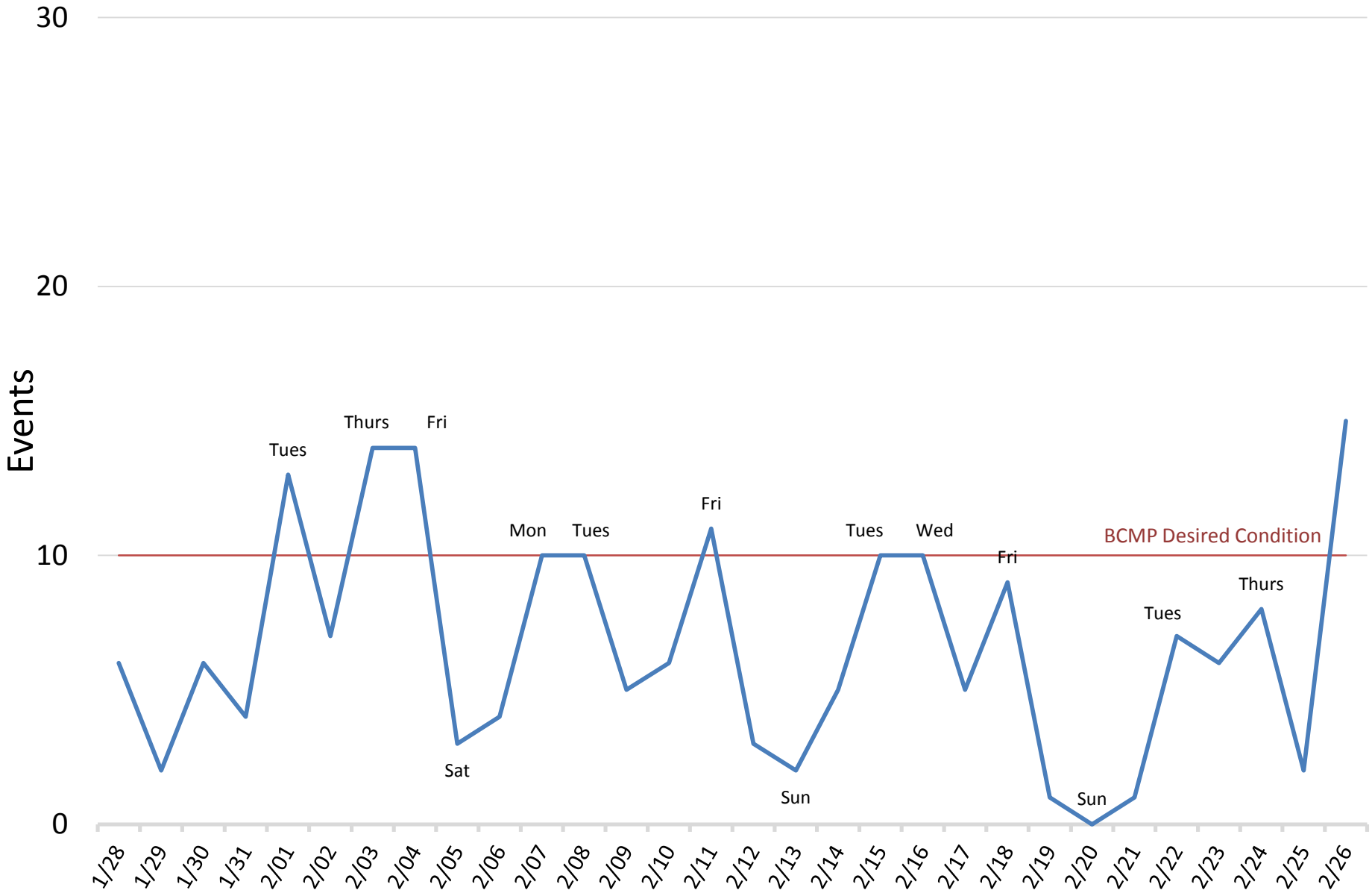
2011 Stampede Airstrip

Number of Aircraft Events Per Day Over Natural Ambient



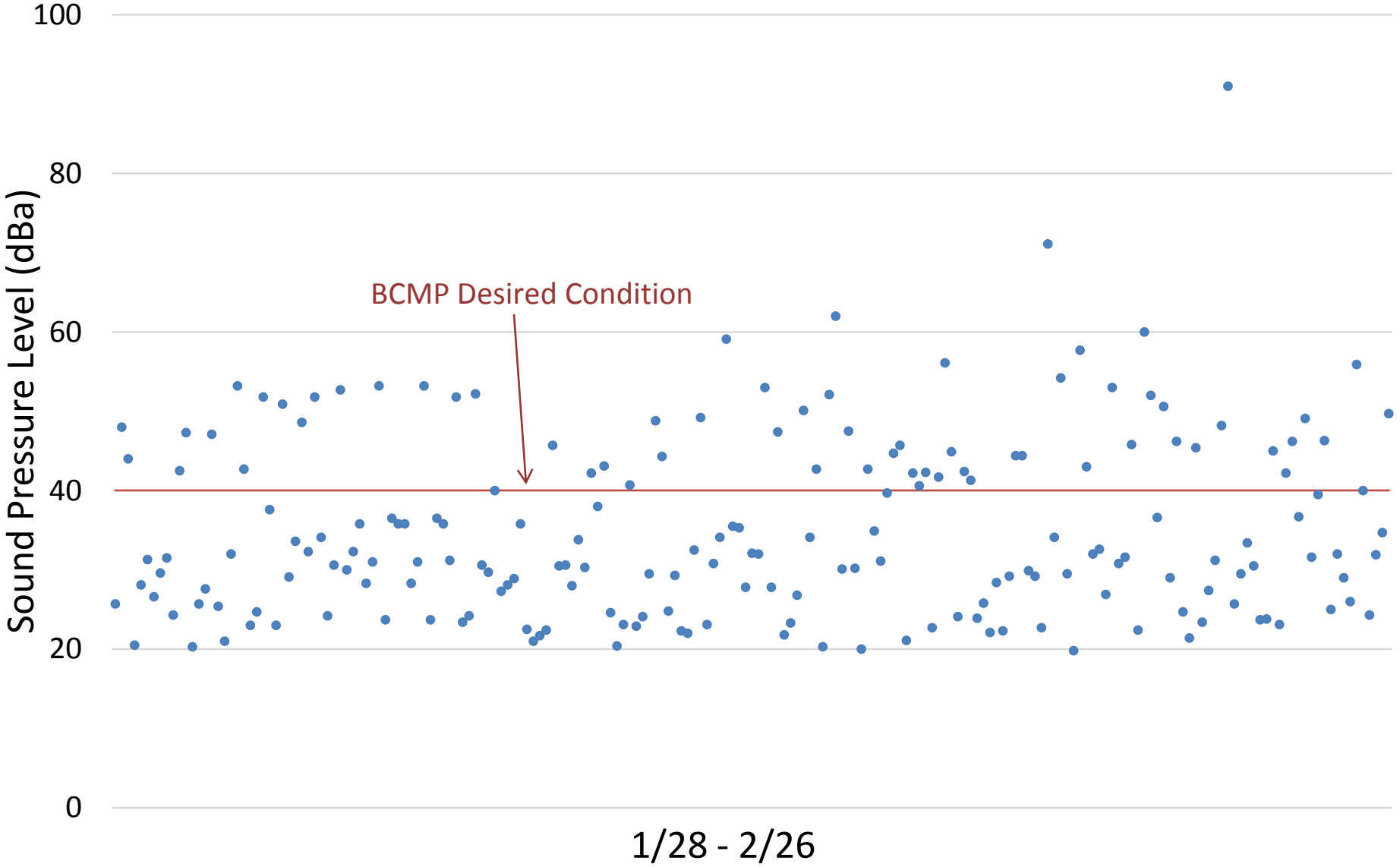
2011 Stampede Airstrip

Number of Aircraft Events Per Day Over Natural Ambient



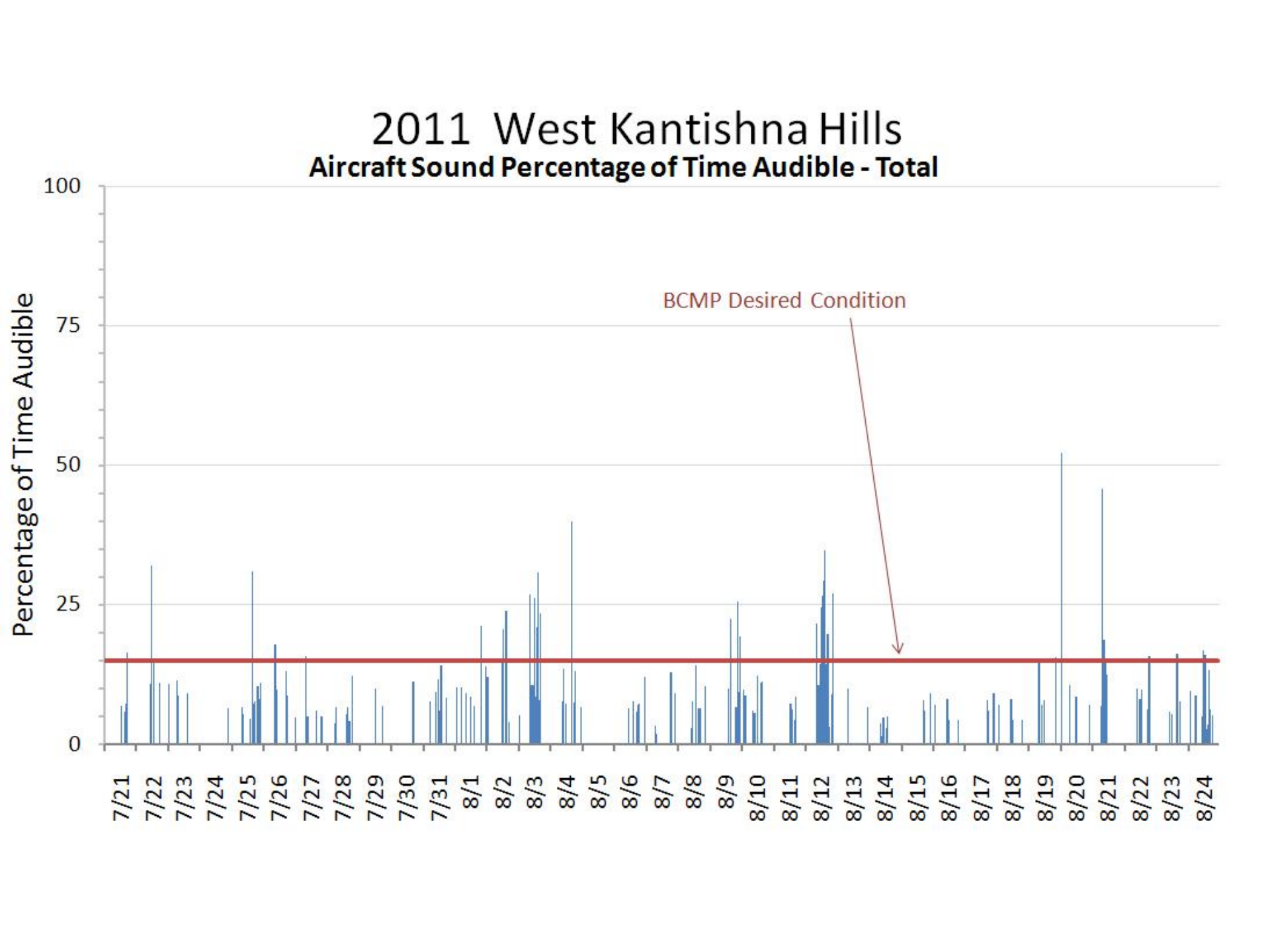
2011 Stampede Airstrip

Maximum 1 Second SPL for Each Aircraft Event



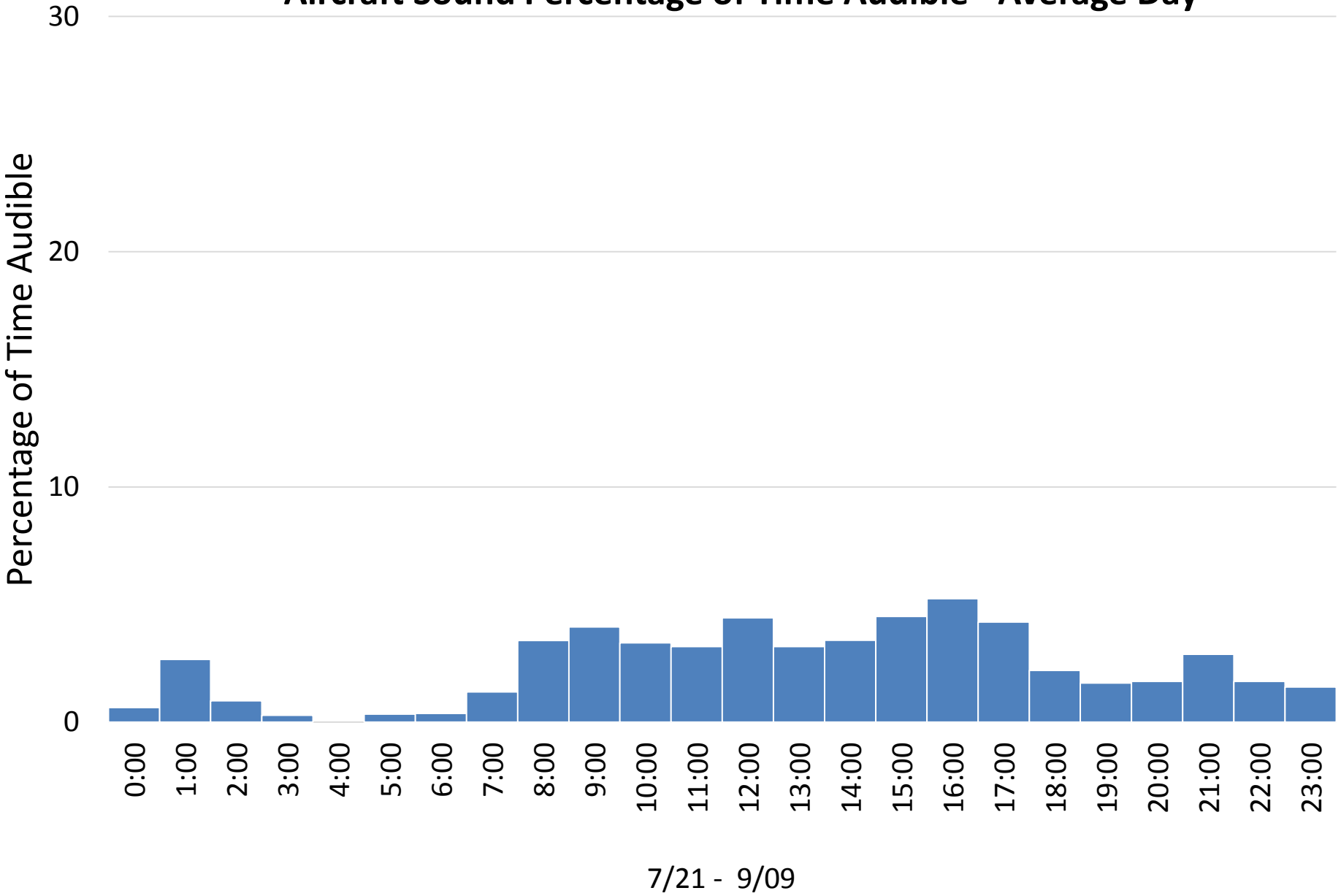
(Average Max SPL: 35.1 Total Number of Events = 199)

West Kantishna Hills / WEKH


2011 West Kantishna Hills
Aircraft Sound Percentage of Time Audible - Total
Percentage of Time Audible
100
75
50
25
0
BCMP Desired Condition
7/21
7/22
7/23
7/24
7/25
7/26
7/27
7/28
7/29
7/30
7/31
8/1
8/2
8/3
8/4
8/5
8/6
8/7
8/8
8/9
8/10
8/11
8/12
8/13
8/14
8/15
8/16
8/17
8/18
8/19
8/20
8/21
8/22
8/23
8/24

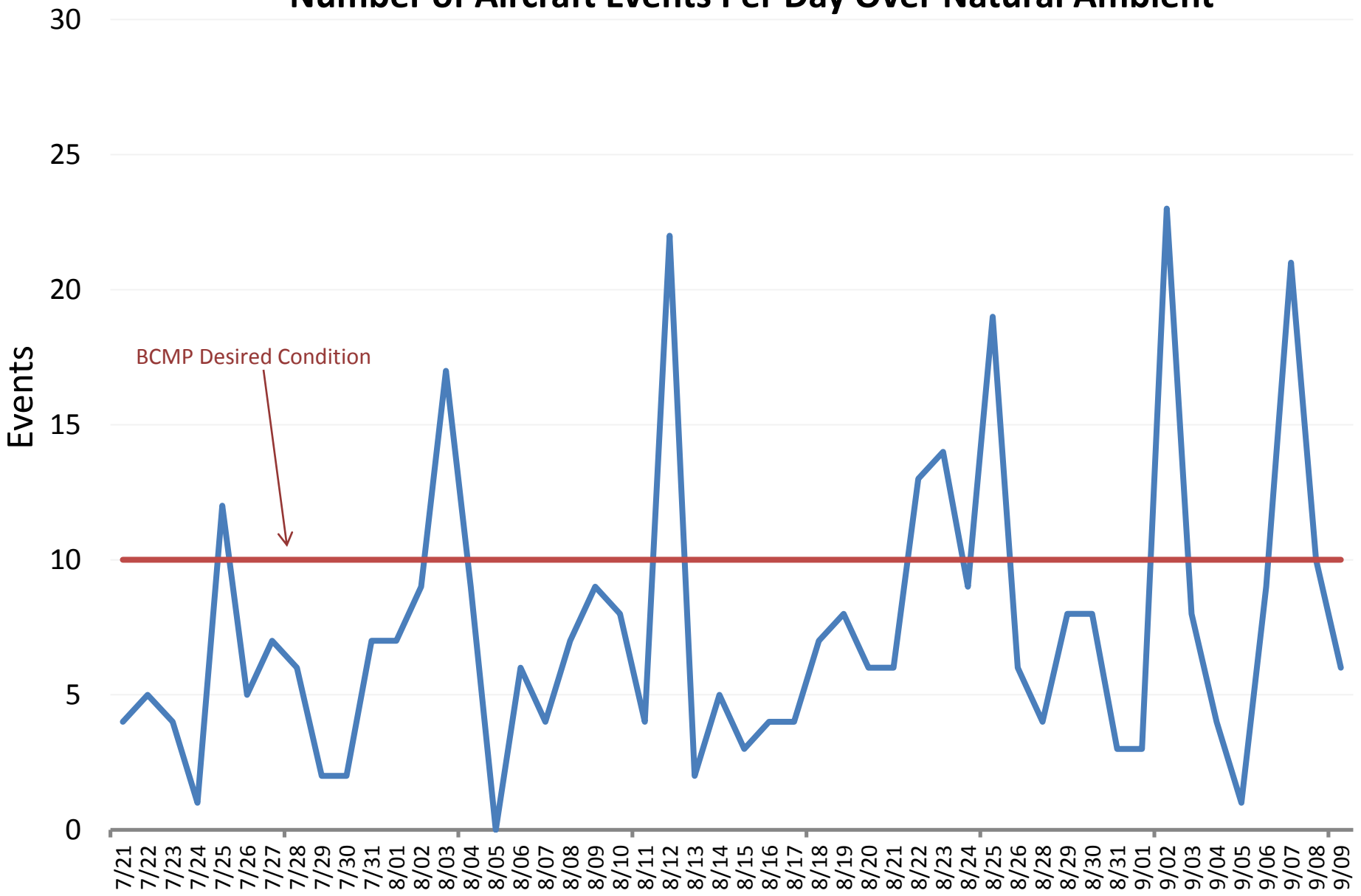
2011 West Kantishna Hills

Aircraft Sound Percentage of Time Audible - Average Day



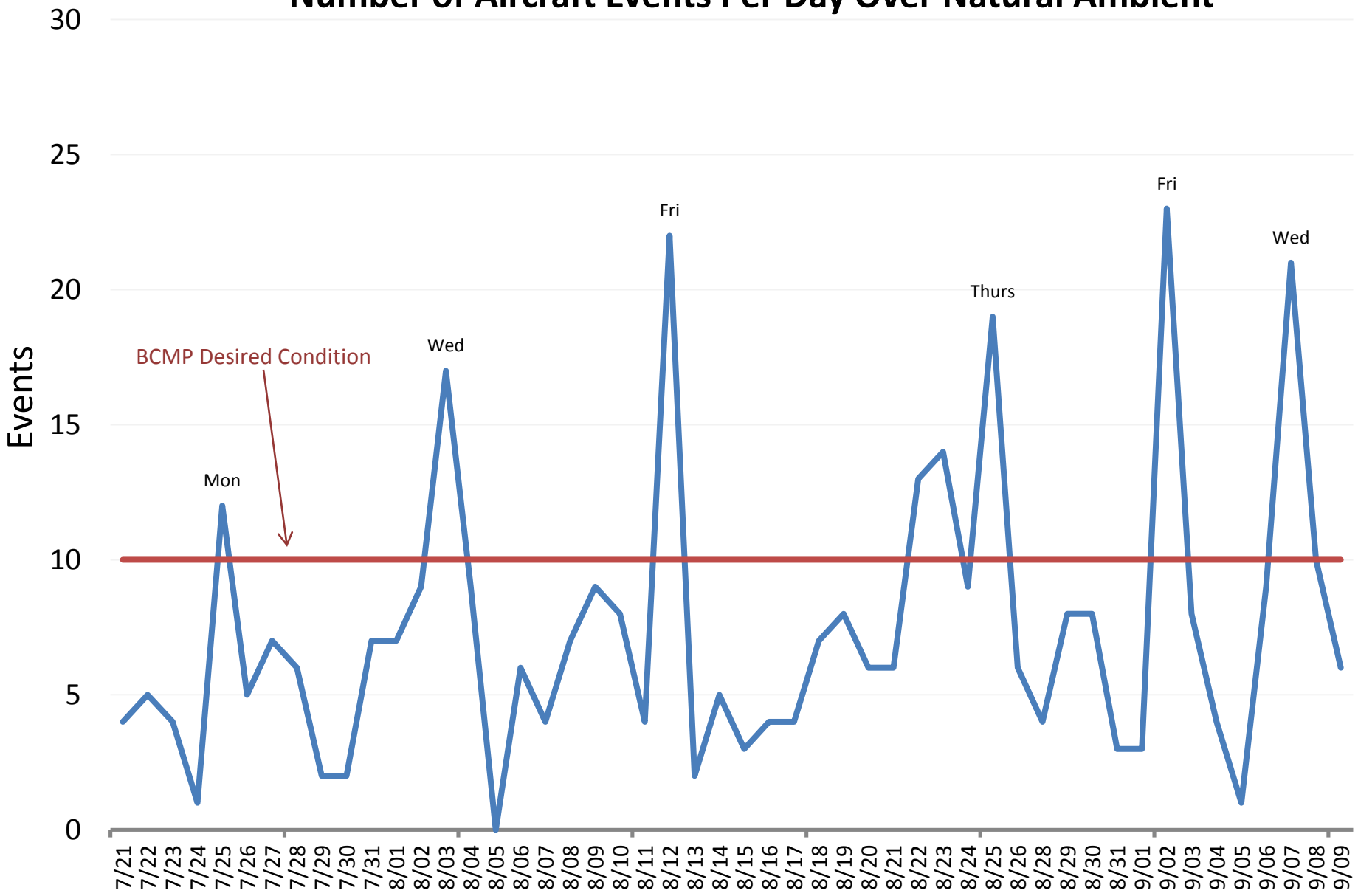
2011 West Kantishna Hills

Number of Aircraft Events Per Day Over Natural Ambient



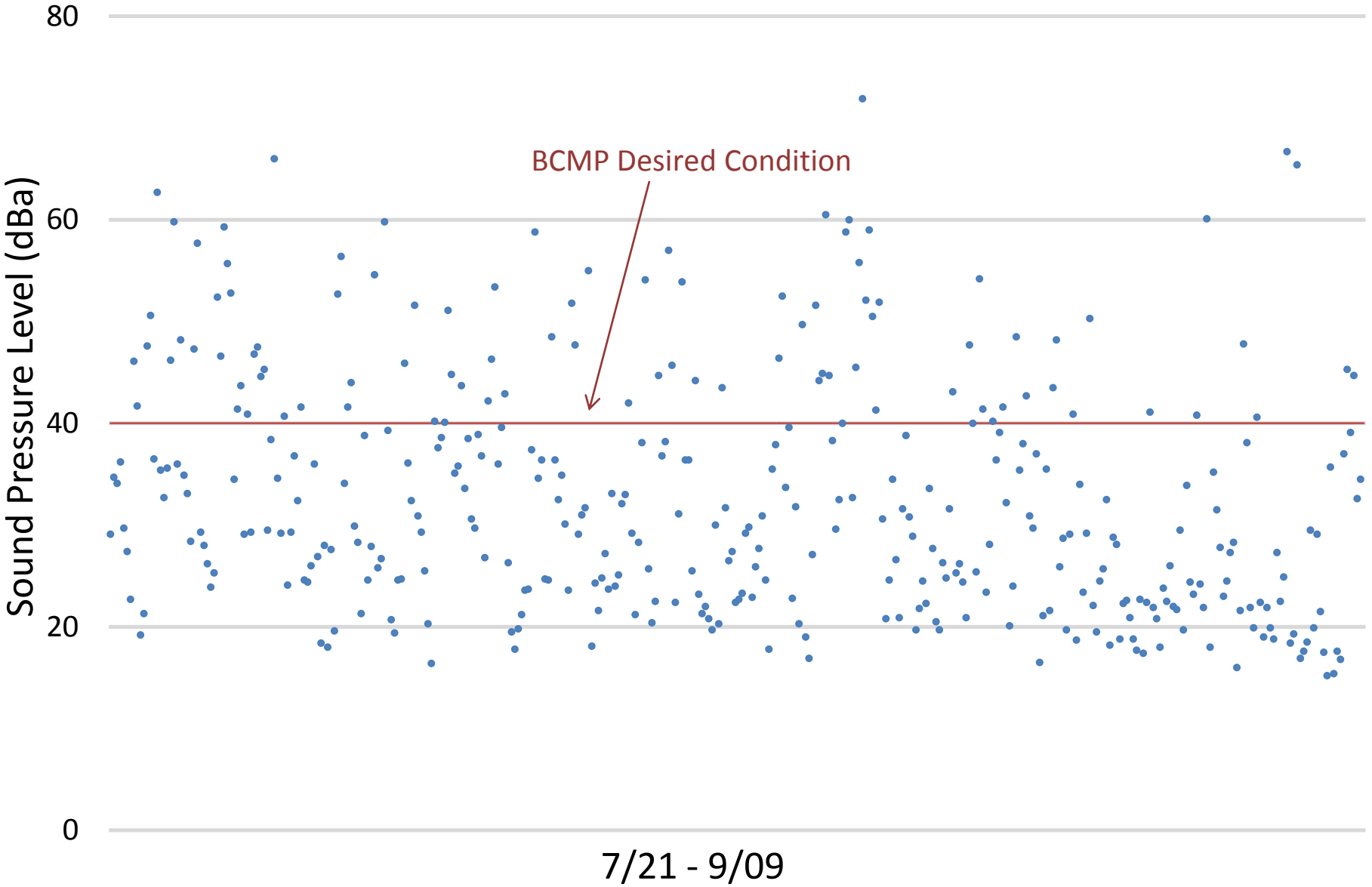
2011 West Kantishna Hills

Number of Aircraft Events Per Day Over Natural Ambient



2011 West Kantishna Hills

Maximum 1 Second SPL for Each Aircraft Event



7/21 - 9/09

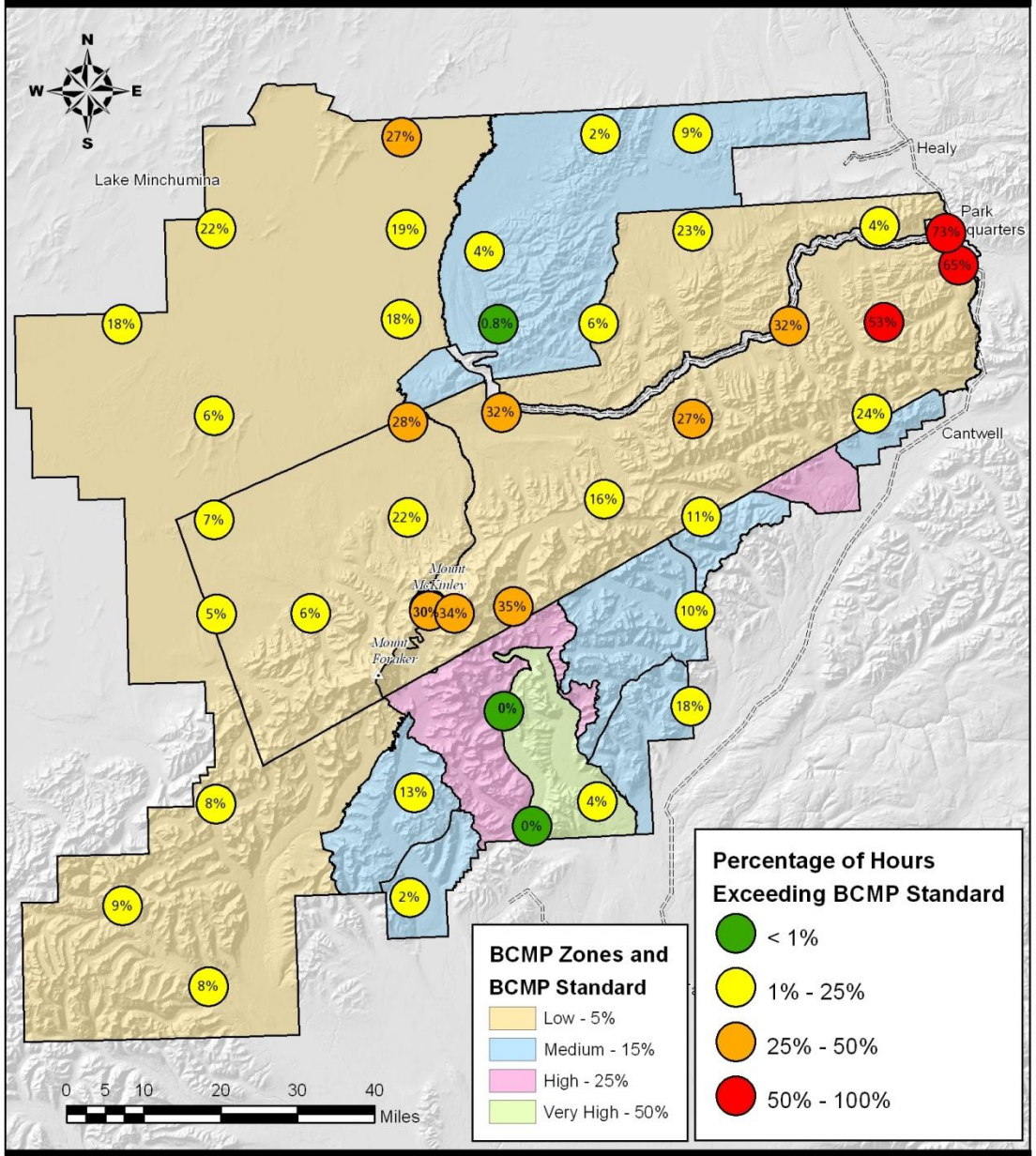
(Average Max SPL: 32.6 Total Number of Events = 375)

Spatial Relationships

Denali National Park Soundscape Monitoring 2006-2011

BCMP Standard #1: Portion of Any Hour Which Motorized Noise is Audible

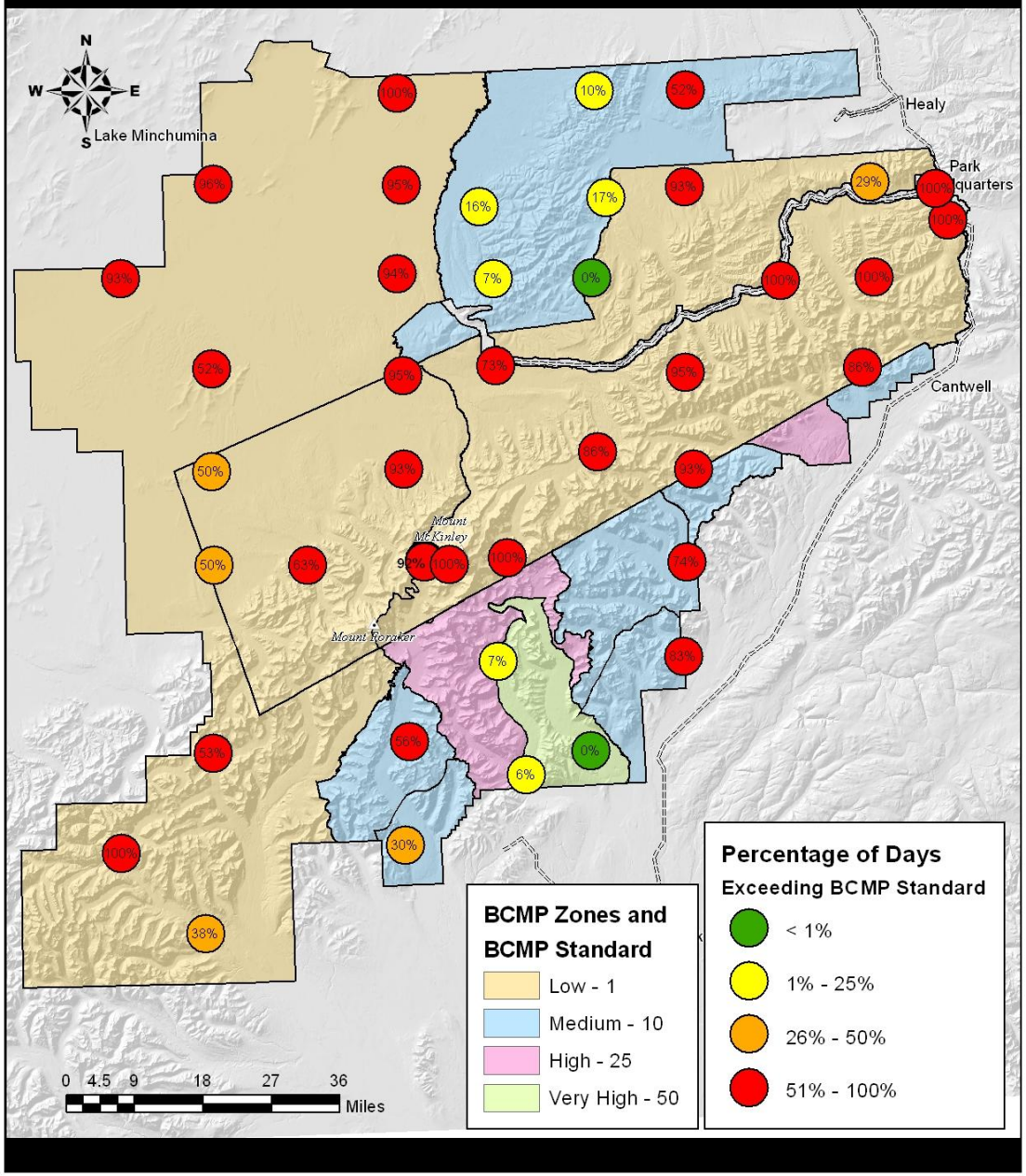
Percentage of Sampled Hours Exceeding Standard (Aircraft Only)



Denali National Park Soundscape Monitoring 2006-2011

BCMP Standard #2: Number of Motorized Events Per Day Greater than Natural Ambient

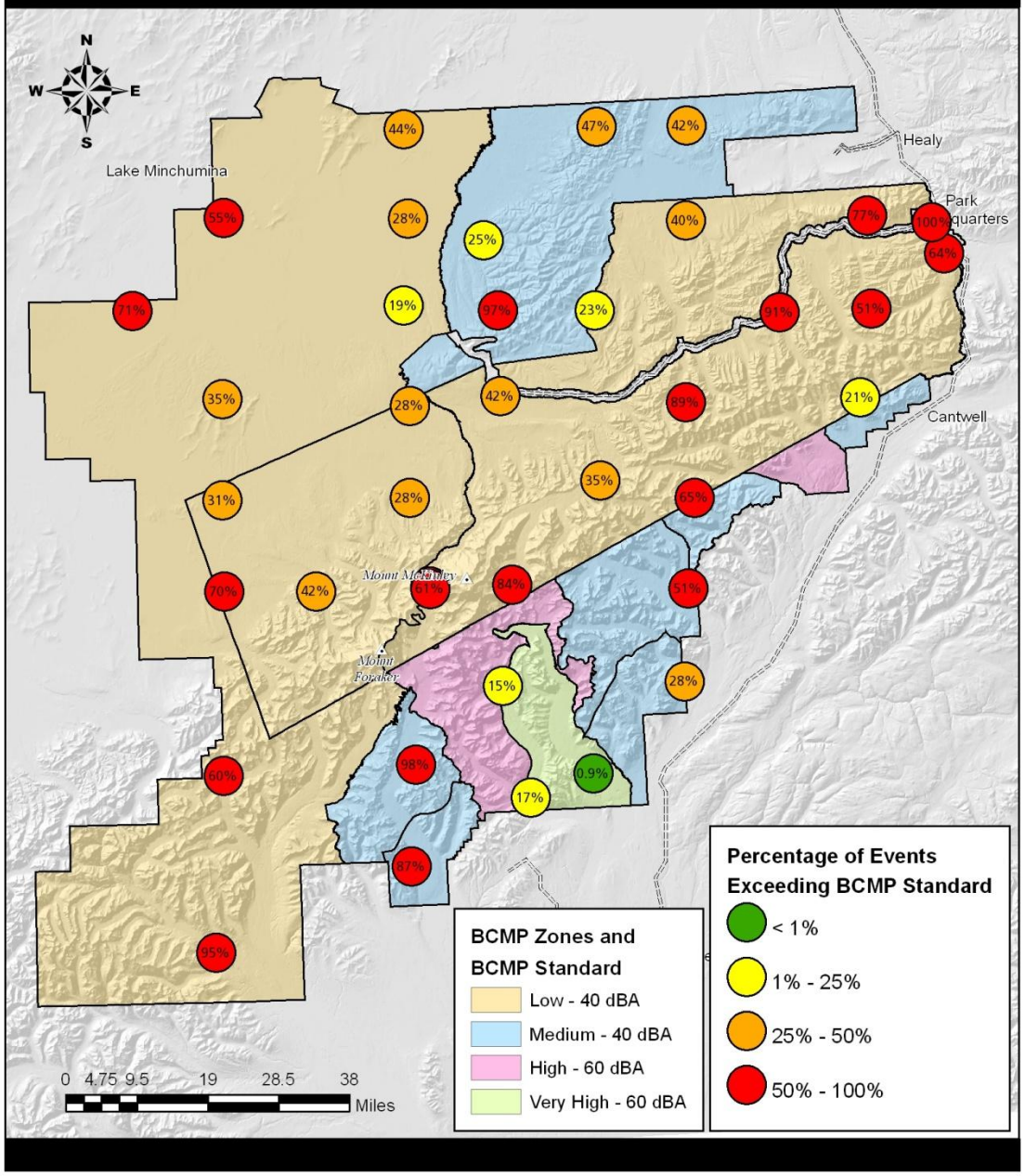
Percentage of Sampled Days Exceeding Standard (Aircraft Only)



Denali National Park Soundscape Monitoring 2006-2011

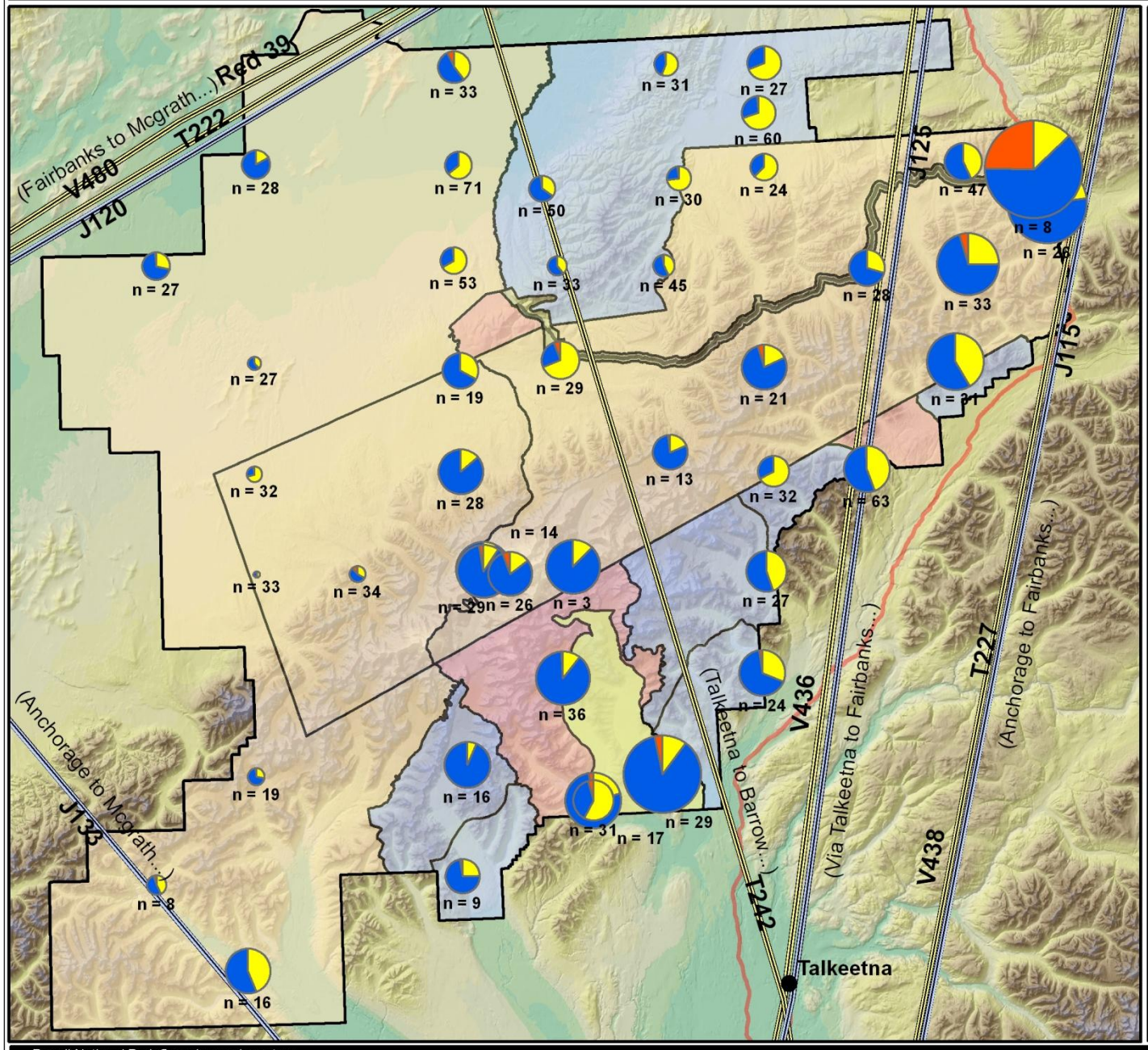
BCMP Standard #3: Maximum Motorized Sound Pressure Level

Percentage of Sampled Events Exceeding Standard (Aircraft Only)



Percentages of Aircraft Audible By Type: All Sites 2006 - 2011

Alaska Region
National Park Service
U. S. Department of the Interior



Aircraft Audibility By Type

- Percent_Jets
- Percent_Props
- Percent_Helicopters

BCMP Management Zones

- Low
- Medium
- High
- Very High

- Low Altitude IFR Route
- High Altitude IFR Route

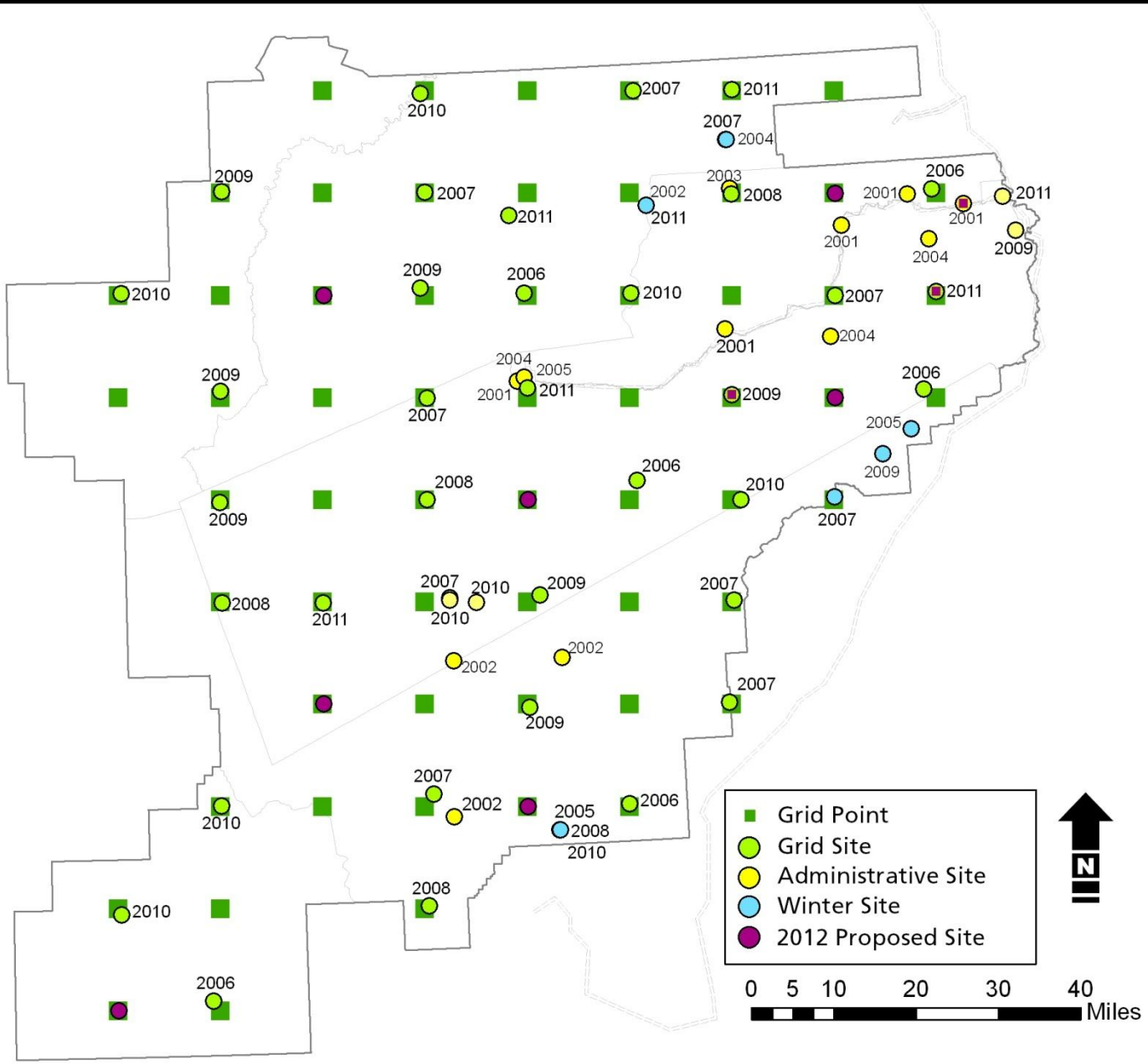
N
W E
S

0 4.75 9.5 19 28.5 38

Miles

n = number of days analysed

Denali Soundscape Monitoring: Sampling Locations 2001 - 2012

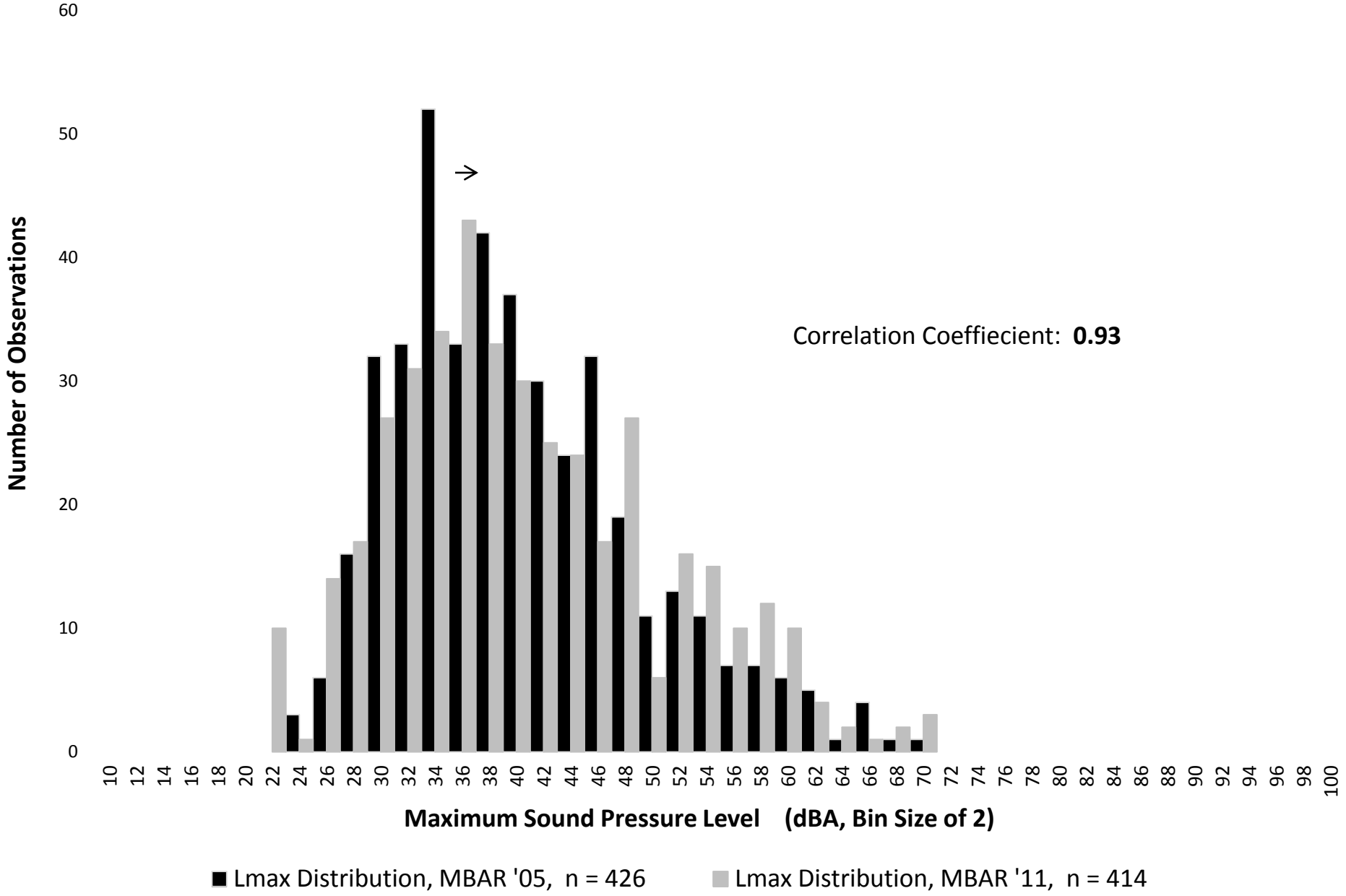


How can we compare sites that have been resampled?

A few examples…

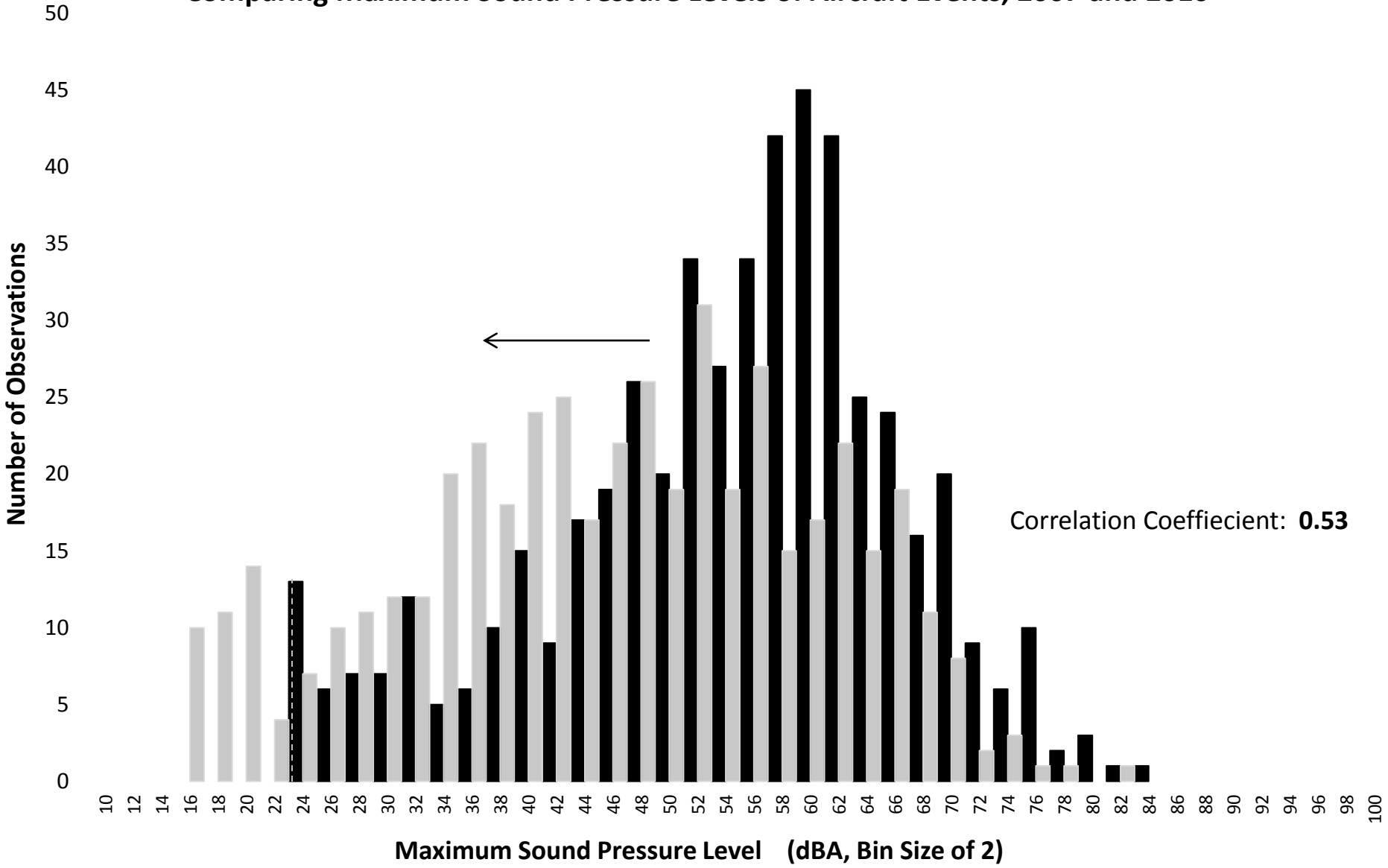
McKinley Bar Trail

Comparing Maximum Sound Pressure Levels of Aircraft Events, 2005 and 2011



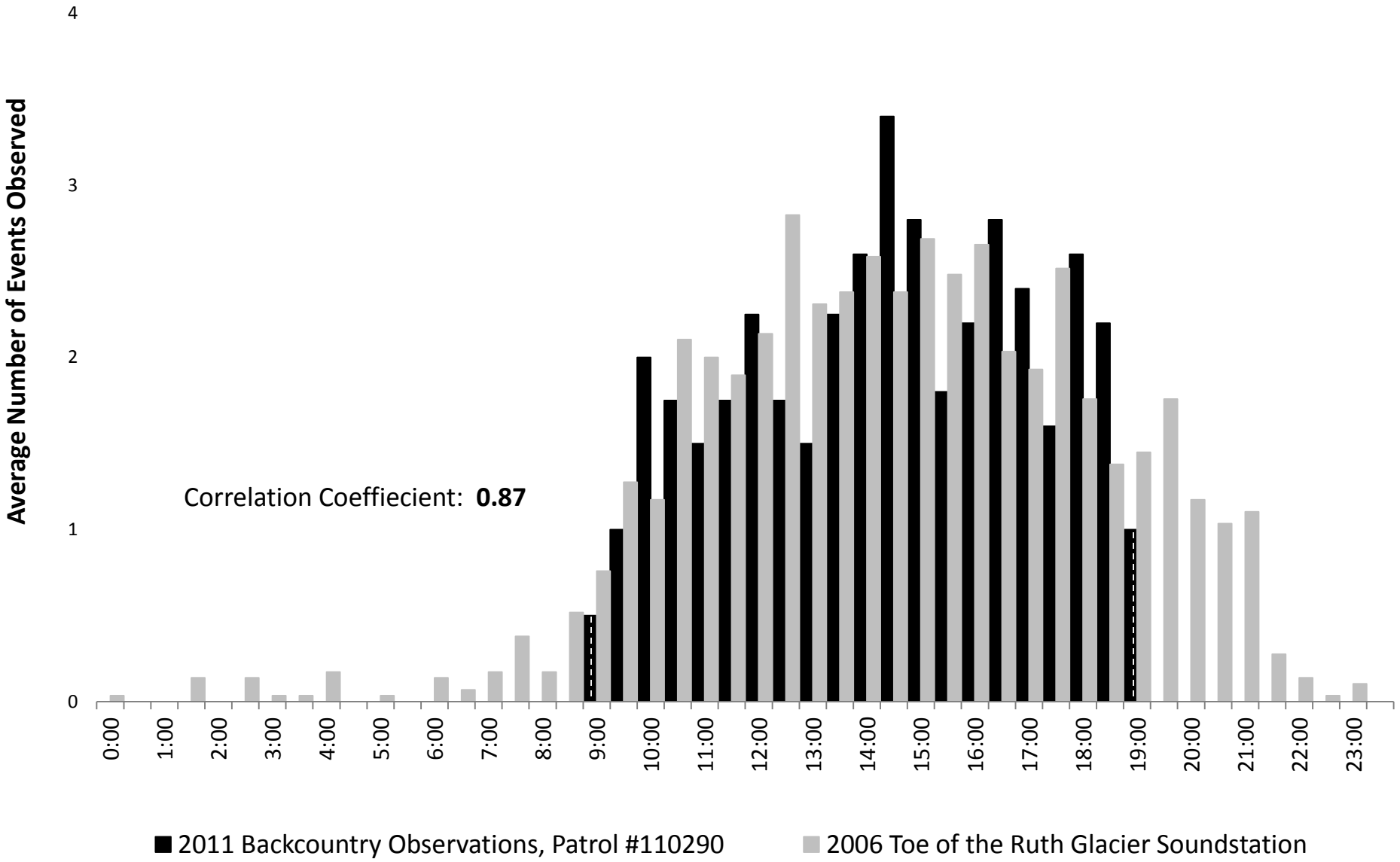
Kahiltna Pass

Comparing Maximum Sound Pressure Levels of Aircraft Events, 2007 and 2010



Average Number of Overflights Heard Per Half-Hour

(Comparison of 2006 Measurements and 2011 Direct Observations)



Backup Slides...

Additional Graphs of Interest…

The following graphs are meant to show comparisons between a few of the sites that we've already had a chance to resample. I think you will find that they are interesting, especially as a tool to visualize the effects of past and future 'best practice' recommendations.

1) **McKinley Bar Trail** - This graph compares measurements made in 2005 and 2011, showing a distribution of the maximum sound pressure levels measured for all aircraft. From the graph, it is apparent that the sound pressure level of air traffic near the McKinley Bar Trail has not changed much over the past seven years. [Correlation coefficient: 0.93]

2) **Kahiltna Pass -** This graph compares measurements made in 2007 and 2010. Between the two sampling periods a best practice, '*to avoid the 17,000 and the 14,000 foot camps and make approaches east of the south summit and north of the north summit*,' was suggested by the council. The difference between years is apparent, and may be due to a change in aviation practice, although some of the difference may also have been due to inclement weather conditions during the 2010 season. Either way, a large number of events between 56 and 66 decibels seem to have been shifted towards quieter levels. This makes sense in physical terms - increasing the distance from a source will decrease the sound pressure level experienced. [Correlation coefficient: 0.58]

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Additional Graphs of Interest…

3) **Toe of the Ruth Glacier / Tokosha Mountains -** This graph shows a comparison between automated measurements taken in 2006 and observations made in 2011 by a Ranger on patrol in the same area. (Patrol #110290 wound along the Toe of the Ruth Glacier up into the Tokoshas along the Ruth, and returned along a similar route.) Though the patrol only lasted five days, it represented a variety of weather conditions, and therefore a variety of flying conditions. (For instance, the maximum number of overflights observed on a day was 77, the minimum was 3.)

There is an important distinction between this graph and the previous two. The x-axis of the third plot is in *time*, not sound pressure level. In other words, it is giving a picture of the distribution of events across the day. From the graph it is apparent that the two types of measurements – human and automated – compare to a considerable degree, presuming that the traffic patterns have not changed much over time. [Correlation coefficient: 0.87]

<u>A few notes on making comparisons</u>:

For MBAR and KAHP, an equal number of days were compared. For RUGL, an unequal number were compared. All sites were compared during the same time of year. On each graph, the value 'n' indicates the total number of events observed during the sampling period. These graphs consider jet, propeller, and rotor-wing aircraft together.